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1952.
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NEW ZEALAND JOURNAL OF Agriculture

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This Month's Cover

Tobacco picking in Nelson, where the whole of New Zealand's commercial tobacco crop of about 4000 acres is grown, is the subject of this month's cover, which has been reproduced from an Ektachrome (Kodak (N.Z.) Ltd.) photograph by T. Lloyd. The centres of production are the Riwaka and Motueka districts and the Motueka River valley and its tributary valleys, where there are light, sandy soil types suitable for the crop. Motueka is the leaf-buying centre where the main manufacturing companies have their buying floors and leaf-conditioning establishments. By law cigarettes manufactured in New Zealand must contain 30 per cent. of domestic leaf, but since 1948-49 manufacturers have voluntarily agreed to 32.5 per cent.

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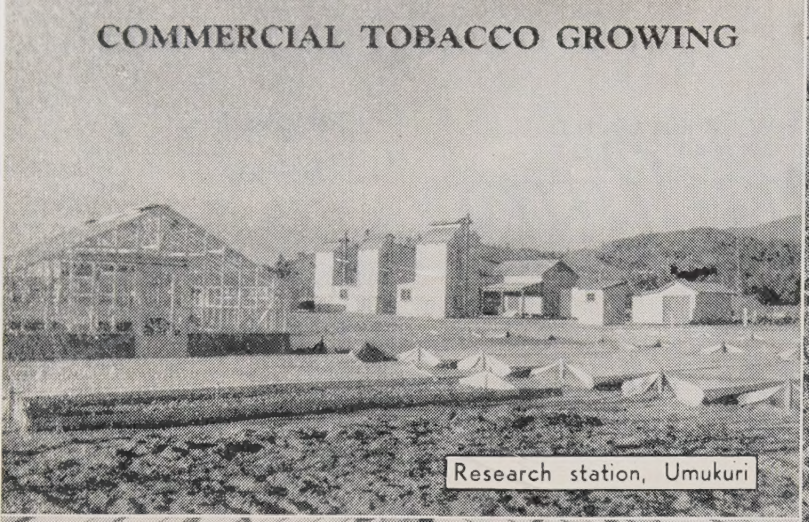
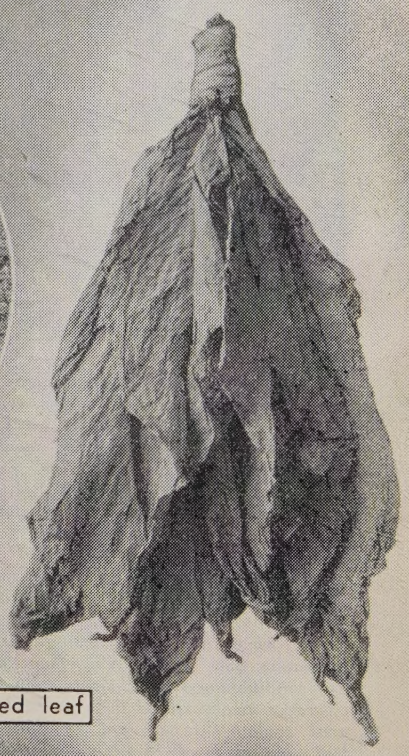


Research station, Umukuri

Tobacco crop, Riwaka

Seedlings for pricking out

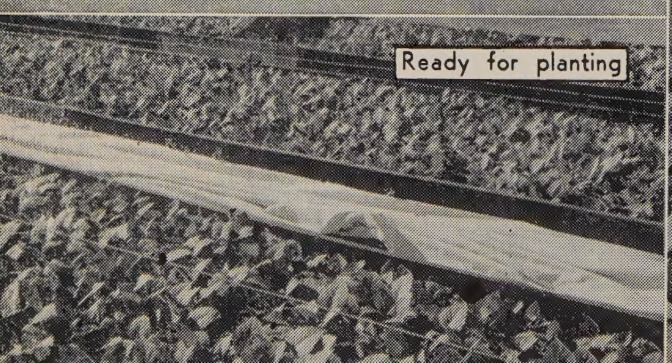
"Bulks" after kiln drying



"Hand" of graded leaf

Commercial tobacco growing in New Zealand is confined to Waimea County of the Nelson Province, where climatic conditions favour the production of high-grade leaf. The special conditions for tobacco growing are abundant sunshine, a rainfall of about 40in. annually, absence of high winds, and an absence of frosts during the growing period. About 4000 acres is grown annually and averages 5,000,000lb. of dried leaf of the flue-cured type.

[Photographs by National Publicity Studios, Ellis Dudgeon, and A. R. Kingsford.



Ready for planting

Picking leaf

The Home Garden in October

By C. L. NAPIER, Horticultural Instructor, Department of Agriculture, Hastings

IN October general sowing and planting throughout the Dominion can take place, and gardeners should expect good weather for growth from now on. Unfortunately the improved weather not only favours growth of most vegetables but increases the danger of attack from many pests and diseases. Vegetables and insects and diseases thrive best and multiply rapidly under the warmer conditions of summer; therefore, if satisfactory crops are to be expected, gardeners must be continually on the alert for diseases and pests and take adequate steps to control them before they become firmly established. In this article some causes of and control of vegetable diseases in general will be discussed. Next month's article will deal with pests.

PLANT diseases can be of five main types; namely, fungous, virus, bacterial, physiological, and deficiency.

Fungous Diseases

Fungous diseases are perhaps the largest group and annually cause thousands of pounds worth of losses in both private and commercial vegetable gardens. Fungi are primitive plants which lack chlorophyll (the green matter in plants) and thus are unable to manufacture their own carbohydrates from the air. Most fungi are dependent on green plants, and if present in sufficient quantity, can weaken the vitality of the plant.

Of the fungi the mildews are probably the best known by the home gardener. Downy mildew is common on vegetables, particularly on brassicas and lettuce seedlings, and shows as a fine downy or furry growth over the leaf surface, and powdery mildew can cause severe damage to peas. Rusts are another type of fungus quite common in vegetable gardens. They often appear as reddish brown pustules on leaves of silver and red beet, broad beans, and many other plants.

Another damaging group of fungi are soil borne. They attack either seeds or plant roots and stems. Germination losses through fungal attack are probably greater than many realise. Pea seeds are commonly attacked by soil-borne fungi, particularly in the early part of the season. Stem-attacking fungi are responsible for soft stem rots of lettuces, stem rots of tomatoes causing bleaching of the stem and then plant collapse, and for verticillium and fusarium wilts of tomatoes particularly, but of other plants also. Fungi which attack stems and roots are not usually apparent, but their presence is indicated by the effect they have on the plants. Wilting is generally the main symptom.

Another economically important fungus is that of late blight, also known as Irish blight and potato blight. It can cause severe losses of potatoes and tomatoes. The disease first shows as irregular, dark brown to black water-soaked patches on leaves and stems, after which a downy growth is produced. Infected leaves later become blackened, and it is this symptom that is usually noticed by the gardener. It can be likened to frost damage.

Virus Diseases

Viruses are as yet of unknown origin. It is not known whether they are of a living or non-living nature, but it is known that they are capable of multiplying only within living plant tissue. Some, like tobacco mosaic, have the power to carry over in a viable state for long periods; this particular virus can be transferred from processed tobacco to tomato plants on the hands of any gardener who smokes.

[*Sparrow Industrial Pictures Ltd. photo.*

When stirrup or bucket pumps are used for spraying a more efficient job can be made if one person pumps and another applies the spray.

Viruses cause many different symptoms, but generally stunting of growth is the most evident. The main viruses most likely to be encountered by the home gardener are given below.

Cauliflower mosaic is found mainly on cauliflowers, but can infect other brassicas. It causes stunting of plants and typical mosaic of light green areas mingled with the natural green of the leaf.

Spotted wilt of tomatoes, lettuces, and peas can also cause stunting. Typical symptoms apart from this are bronze or necrotic markings on the leaves. The markings may later coalesce to give large brown areas. Bunching of the tops of tomatoes may occur and rosetting and non-hearting of lettuces are common. Spotted wilt of tomatoes is also known in some districts as "bronze top".

Cucumber mosaic can occur on tomatoes and most cucurbits. Mildly affected tomatoes show light and dark green mosaic in the leaves, but in severe cases the leaves show a definite narrowing or fern-leaf appearance. Cucurbits are often stunted and where infection is severe no growth results after infection occurs.

Lettuce mosaic appears to be becoming more serious and can cause heavy losses. Lettuces are usually stunted and often fail to heart. The leaves are usually crinkled and leaf edges very "feathery".

Tobacco mosaic is found on tomatoes, cape gooseberries, and peppers in the home garden. On tomatoes the leaves are usually slightly puckered. Some mottling may occur and plants may be slightly stunted.

Potato viruses are numerous and can cause varied symptoms, including leaf rolling, mosaic, and stunted growth.

There are many other viruses, including those that attack beans, rhubarb, and onions, but normally they are not as troublesome as those described.

Freshness Affects Value of Vegetables

Home-grown vegetables besides providing essential foods at low cost can be harvested and used immediately, and consequently little of their nutritive value is lost. This is not so with commercially grown vegetables, because as gardens become further removed from markets, a certain amount of spoiling, and therefore loss of food value, is unavoidable. Freshly picked vegetables are superior in flavour to those harvested for a period, and only an amount required for one meal need be removed from the garden at one time. If gardeners do not delay, they may still make provision for adequate supplies of vegetables for summer and, more important, provide for winter those greens and root vegetables which are so important in the daily diet.

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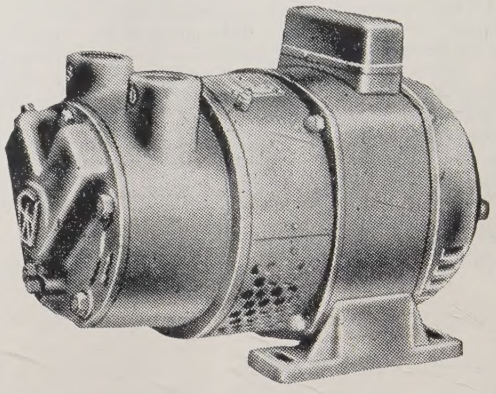

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Bacterial Diseases

Bacteria are some of the simplest of organisms and most comprise only one cell. They are microscopic. Relatively few vegetable diseases are caused by bacteria, but some bacterial diseases can be very serious. One of the most common groups causes soft rots of root vegetables both in the field and in storage. Bacterial blight of beans causes greasy or water-soaked spots which are a little darker than the normal green of the plant and which are surrounded by a light green or yellow halo.

Physiological Diseases

Physiological diseases are generally those producing some upset in the growth or health of the plant. Excess or lack of moisture, lack of shelter, and poor soil conditions are only a few causes of physiological upsets.

Deficiency Diseases

Deficiency diseases are caused through the lack of some plant nutrient, such as boron, molybdenum, or copper. There are many elements that may be deficient, but on normal, well-cared-for soils it is only occasionally that the addition of a trace element (an element required only in minute amounts) is necessary.

Causes of Diseases

Plant diseases can result from many causes, most of which can be partly or wholly eliminated by the gardener. The only major factor over which the home gardener has almost no control is climate, unless of course he is able to utilise glasshouses, frames, or cloches, all of which give a minor degree of control.

Control of Diseases

Many gardeners will realise that disease can be greatly reduced, if not eliminated, by paying attention to general methods of culture in the garden. Most of these have been mentioned in previous notes, but are given briefly again.

Soils must be well drained if healthy crops are to be expected. Wet soils can cause physiological troubles, deficiencies, and even excesses of plant foods and may encourage diseases such as club root and damping-off fungi.

Soils should contain well-balanced plant foods. This will guard against deficiency diseases, and if the soil is in good physical condition, healthy plants are more likely to result. Healthy plants are in a better position to withstand diseases than weak ones with succulent tissue.

Plants should not be too close to one another as this will encourage damp conditions favourable to many fungi and in any case will tend to give weaker plants, because they are more confined.

Rotation of crops should be practised where possible to guard against the establishment of diseases such as club root of brassicas, wilts of tomatoes, rots of lettuces, and many others. A system whereby a plot grows the same crop every 3 or 4 years is ideal.

Seed should be treated with seed protectants as outlined in the home garden notes of the June issue of the "Journal". This practice tends to reduce attacks from fungi causing rotting of seeds, collar rots, and damping off of many vegetables.

Disease-resistant varieties should be selected. New varieties are continually being produced that are immune to particular diseases or strains of diseases, and several varieties of vegetables which give this immunity are now marketed.

All crop refuse should be destroyed by burning or should be dug in deeply if it is known to harbour plant diseases.

Badly infected plants in a crop should be destroyed when first noticed. This applies particularly where they are infected with viruses such as spotted wilt, which is spread from plant to plant by thrips, and tobacco mosaic, which is easily spread by contact.

Insect pests should be controlled, as many are the means of spreading diseases from plant to plant. The chief offenders are aphides and thrips.

Soil should be sterilised to destroy soil-borne fungi causing fusarium and verticillium wilt and damping-off of seedlings. Soil sterilisation is not possible in all gardens, but some gardeners will no doubt possess facilities for steam sterilisation as outlined in the home garden notes in the May issue of the "Journal".

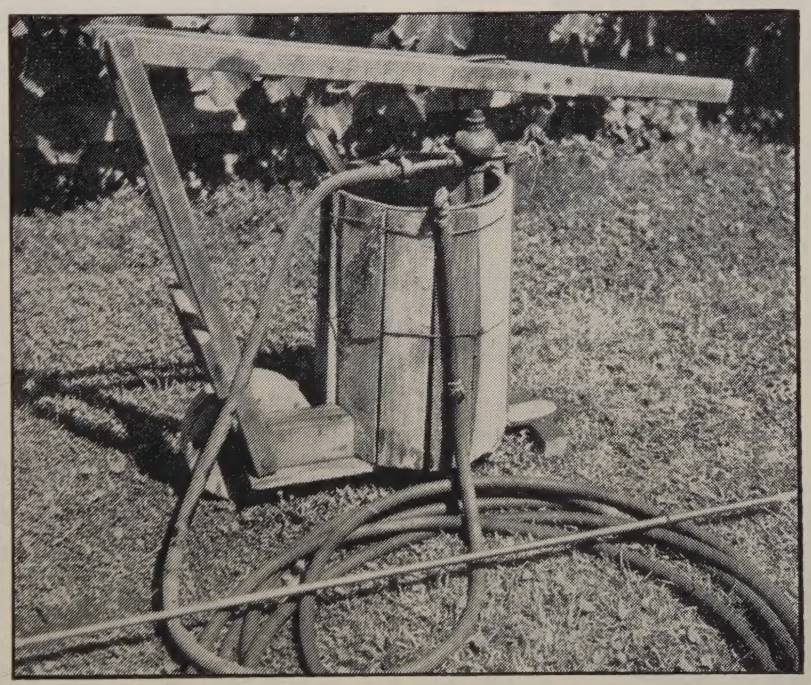
Soil for seed boxes can be sterilised as described in that article and damping-off fungi thus be eliminated and garden plots known to be infected with soil-borne fungi can be made reasonably clean by using the formalin treatment recommended for glasshouse soils in the May article. If infected plots are extensive, this treatment might prove costly, but small plots can be done easily. It is preferable not to plant the same crop in the same plot for a few years even if the soil is sterilised. Absence of host plants will cause any remaining residue of the disease to die out.

Fungicides should be applied to prevent the establishment of diseases.

Fungicides

Fungicides are materials poisonous to fungi but generally harmless to plants. They are more correctly used as preventives than for destroying diseases after they become established. Fungicides should be applied regularly to prevent the establishment of disease, but if this is not possible, they should be applied as soon as the disease is noticed to prevent its spread throughout the crop. This is particularly important with fungi such as late blight on potatoes and tomatoes, which spreads very rapidly.

The term fungicide is used to cover the group of sprays used to control plant diseases including fungi and some bacteria. The most common fungicides in everyday use are the sulphur group (such as lime sulphur and colloidal sulphur), Bordeaux mixture, Bordeaux substitutes (such as the copper oxychlorides and oxides), and Cheshunt compound.



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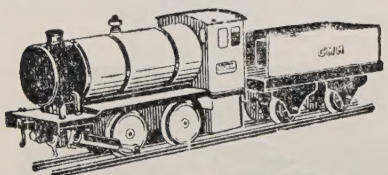

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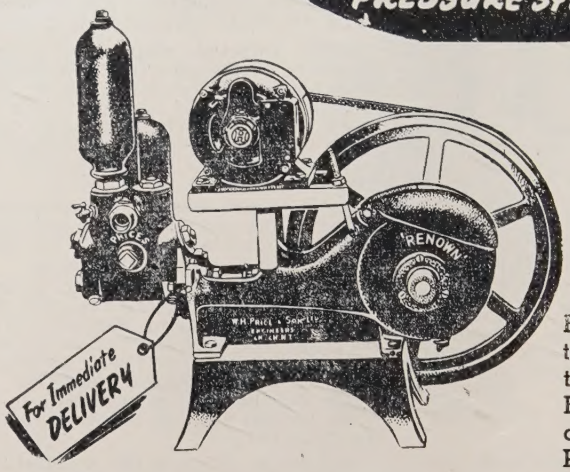

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The application of sprays should not replace sound cultural practices outlined earlier. When these fail to prevent disease spraying should be resorted to.

Physiological, deficiency, and virus diseases cannot be controlled by spraying, except that some deficiency diseases can be overcome in a particular crop by spraying the plants with a material containing the plant food which is deficient; the incidence of virus diseases can be reduced by destroying the insects that spread them. However, once a plant contracts a virus disease no amount of spraying will cure it.

Following is a brief account of the fungicides, how to prepare them, and the more important diseases against which they are used.

Bordeaux Mixture

Bordeaux mixture is a mixture of bluestone, hydrated lime, and water. It is one of the oldest and still one of the most valuable fungicides known. Under some conditions it appears to improve the health of crops and this is probably due to intake of small amounts of copper. To prepare 4 gallons of Bordeaux mixture proceed as follows: Dissolve 4oz. of bluestone in a pint or so of hot water in a glass or earthenware container. Mix 5oz. of hydrated lime to a thin, smooth paste in another container and strain it into about 3 gallons of water in a petrol tin or other suitable container; then add the dissolved bluestone while stirring vigorously. Bring the mixture up to the 4 gallons and use it promptly. It tends to adhere well to plants and is very effective in the presence of moisture. Bordeaux mixture can be used for the following diseases:—

Leaf spot of silver beet, which can be very troublesome in cold, wet weather.

Halo blight, a bacterial disease, on bean pods. This disease tends to spread in wet weather.

Downy mildews of brassicas, cucurbits (may cause a slight check in growth on cucumbers and marrows—a copper dust may be preferable), lettuces, onions, and peas.

Leaf spots of beets, celery, lettuces, rhubarb, and tomatoes.

Chocolate spot and anthracnose of beans.

Bacterial wilt of beans.

Late blight of potatoes and tomatoes.

Grey mould of tomatoes.

Storage rots of cucurbits (treat as detailed in the home garden notes in the February issue of the "Journal").

Bordeaux Mixture Substitutes

Dry Bordeaux powders are available as commercial preparations, but unfortunately are not as effective as the spray made up from the separate ingredients. There is at least one preparation available with the ingredients in separate containers, and this should be more effective than mixed ingredients.

Copper compounds of a different nature from Bordeaux are available and have proved effective against several diseases. They are mainly preparations of copper oxychlorides and copper oxides and are sold under various names. Several brands are certified by the Plant Diseases Division of the Department of Scientific and Industrial Research and have proved effective on tomatoes, potatoes, and celery particularly. They are usually more expensive than and not as effective as Bordeaux mixture, but are prepared for use simply by mixing the powder in water.

Colloidal sulphur: This spray is sold under various trade names and many of the products are certified. Colloidal sulphur is a preparation of sulphur of minute size in suspension in water. It is a valuable spray for the control of mildews. Colloidal sulphur is normally used at 1½ to 2 fl. oz. to 4 gallons of water.

Lime sulphur is a dual-purpose spray, being effective against fungi and some insect pests. It is generally used at a dilution of 4 fl. oz. to 4 gallons of water. As lime sulphur deteriorates when exposed to the air, unused portions of the concentrated material should be kept in tightly corked bottles.

Lime sulphur and colloidal sulphur, which control rusts, generally give better results when used in combination. To prepare the spray add 4 fl. oz. of lime sulphur and 1 fl. oz. of colloidal sulphur to 4 gallons of water.

Cheshunt compound is valuable for checking damping-off of seedlings in seed boxes if all other methods of control have failed. To prepare it mix 2 parts of finely ground bluestone with 11 parts of ammonium carbonate. Store in a stoppered jar for 24 hours. To use, dissolve 1oz. of the mixture in hot water, make up to 2 gallons, and water the boxes immediately.

Wetting Agents

Wetting agents are preparations designed to improve the spread of a spray over leaf surfaces of particular vegetables. For instance, plants such as brassicas, onions, peas, beets, and rhubarb, have very smooth, waxy surfaces, which cause the spray to run together in globules. Wetting agents tend to spread the moisture into a fine film over leaf surfaces, thus improving the coverage of the plants and effectiveness of the spray. There are several commercial preparations available, and as only very small amounts are required, the recommendations on the labels should be followed closely. About ½oz. to 4 gallons of spray is an average amount to use.

Summer oil can also be used with good effect, but must be used carefully, as plant damage can result. However, it can be used at up to 1 part in 100 parts of the spray mixture on brassicas.

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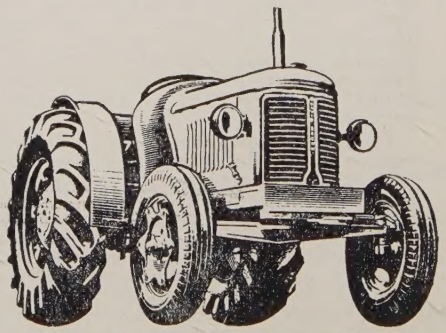

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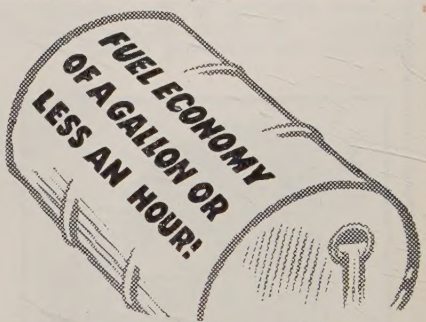

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[*R. W. Orr photos.*

At left—Cauliflower mosaic; healthy cauliflower leaf (left) and affected leaf (right). Above—Dry rot of potatoes usually gains entry through the skin being damaged, in this case by potato tuber moth.

(One part in 100 equals 6½ fl. oz. in 4 gallons.) Used at the rate of 4 fl. oz. in each 4 gallons, summer oil should be safe for general use.

In this general discussion on vegetable diseases the controls for the more common diseases have been given. For more detailed recommendations readers should refer to Department of Agriculture Bulletin No. 342, "The Home Vegetable Garden", which is available from main offices of the Department at 2s. 6d.

Coverage and Regularity of Spraying

Good coverage of plants is essential if efficient disease control is expected. An inefficient job can allow new infections to start on untreated plant tissue. The spray, therefore, is wasted, as also is time. Spray applications must be regular if diseases are to be kept to a minimum. Where sprays are applied as preventives applications are most effective when made about every 10 to 14 days, but when the weather encourages rapid spread of diseases, particularly late blight of tomatoes and potatoes, applications may need to be made more often to keep them in check. When fresh infections are noticed the appropriate spray should be applied as soon as possible to check the spread of the disease before damage is caused.

To ensure the best possible application and effects from sprays, plants should be covered carefully on all surfaces, preferably on a calm day, to reduce wastage in drift. If rain occurs shortly after spraying has been done, it may be necessary to repeat the application.

Reference Tables for Spray Mixing

Liquids

20 fl. oz. = 1 pint
8 pints = 1 imperial gallon
1 gallon of water = 10lb.
7 teaspoons = 1 fl. oz.
8 fl. oz = 1 cup
4 gallons = 1 kerosene tin filled to 1in. of top

Weight

1oz. of crushed bluestone = 1 tablespoon + 1 teaspoon
1oz. of hydrated lime = 3 tablespoons + 1 teaspoon
1oz. of colloidal sulphur = 1 tablespoon (level spoons)

Conversion Table

Bordeaux:	Bluestone	Lime	Water
	oz.	oz.	gallons
5 : 4 : 50 =	6½	5¼	4
3 : 4 : 50 =	4	5¼	4
1 : 3 : 50 =	1½	4	4

Colloidal sulphur 2lb. : 100 = 1¼oz. in 4 gallons of water

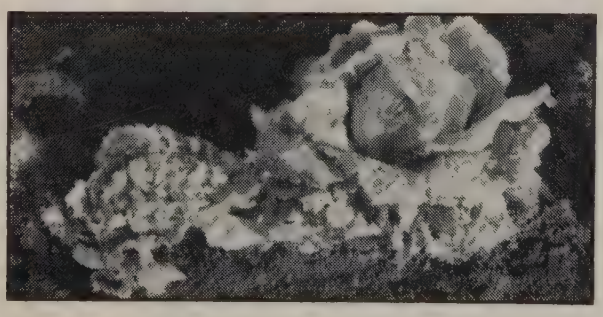
Efficient spray equipment is essential for satisfactory disease control. The better the equipment and the easier it is to work, the more thorough will be the application. Suitable spray equipment for the home garden will be discussed in next month's article.

Garden Work for October

Sowings and plantings of almost all vegetables can be made during October, but caution is still required with subjects such as tomatoes, potatoes, and cucurbits, which are tender and liable to damage from late frosts. The generally improved weather conditions should not, however, encourage the gardener to plant large quantities of vegetables. Small sowings and plantings made regularly will provide a continuity of fresh produce. Of course in districts experiencing rather dry conditions during the months immediately before and after Christmas early and autumn sowings may be necessary if good results are to be expected.

Sowing of seed of autumn and winter crops should begin in October if they are to make good growth before the cooler weather sets in. Maincrop potatoes will be planted in many areas this month, but southern gardeners will need to wait a few weeks to avoid late frosts.

As growth increases weed control will be more necessary and in some districts irrigation will be needed. However, water should not be used unless essential and should be applied in copious quantities at regular intervals and not in light sprinklings every evening.



Lettuce mosaic. Infected plant (left) and healthy plant (right).

Beans of the dwarf and climbing types can be sown in most districts this month provided late frosts are not likely. Recommended varieties are:—

Dwarf: Sure Crop Wax (butter), The Prince, Masterpiece.

Climbing: Scarlet Runner, Fardenlosa.

Climbing beans should be planted in a position where some suitable fence can be erected on which they can climb and yet not shade smaller-growing crops. Climbing beans thrive when they receive copious supplies of water during their fruiting period.

Cabbages for winter use can be sown now in shallow drills, preferably on flat ground in the warmer districts, as drying out may otherwise occur. Varieties such as Copenhagen Market, Golden Acre, and Early Ballhead are suitable in the North Island and Omega and Drumhead in the south.

Cucurbits (marrows, cucumbers, and other vine crops) can safely be sown or planted out (from sowings made under glass) in the open this month in most districts. Cucurbits require good friable loams with plenty of organic matter and adequate supplies of moisture. Transplanting should be done carefully to prevent damage to tender roots. Although many gardeners grow vines on "hills", this method encourages excessive drying out in some districts. Flat planting therefore may be best. Recommended varieties (or types) are:—

Cucumber: White Spine, Long Prickly, Moneymaker, Crystal Apple.

Marrow: Bush: White and green. Bush types are space saving. Trailing: Long green, cream.

Watermelon: Ice Cream, Hawkesbury.

Rock Melon: Honey Dew, Hales Best.

Preserving melon: Citron, Pie Green.

Pumpkin: Red Warren, Queensland Blue.

Squash: Yellow Crookneck, Golden or Red Hubbard.

Tomatoes can be set out as soon as late frosts are past. Good medium loams are satisfactory. Tomatoes should be set out a little deeper than the plants grew in the seed-bed. If planted too shallow, they may be checked by drying out of the soil surface later. Plants should be transplanted with plenty of soil about the roots and firmed in well to assist establishment. Staked varieties can be planted 12 to 20in. apart in rows 3 to 4ft. apart. Dwarfs require more space and should be 3 to 4ft. apart in the rows. Good varieties are:—

Tall: Potentate, Sunrise, Moneymaker, Golden Nugget (yellow).

Dwarf: Tatinta, Adelaide Dwarf, Early Chatham.

Sweet corn, which is becoming increasingly popular, can be used in a variety of ways. Corn can be sown this month and is a valuable plant for providing low shelter throughout the garden. Plants are best grown about 1ft. apart and rows should be no closer than 2½ft. Popular varieties providing plenty of flavour are Golden Cross Bantam and Country Gentleman.

Carrots are vegetables that require adequate moisture in the early stages to make satisfactory growth. In districts with dry summers spring and autumn sowings may be desirable. Seed should be sown very thinly in drills 12 to 18in. apart. Early Horn is a good spring and autumn, quick-maturing variety; Chantenay and Manchester Table are good main-crop varieties.

Seed of the following should also be sown this month:—

Asparagus: Mary Washington, Paradise.

Red beet: Detroit Dark Red, Crimson Globe.

Silver beet: Giant Broad White Ribbed.

Broccoli: Veitches Self-protecting and Roscoff Nos. 1, 2, and 3 (North Island) or Veitches Self-protecting and Lily White (South Island).

Brussels sprouts: Fillbasket, Scrymger's Giant.

Celery: Golden Self-blanching, White Plume.

Leek: Musselburgh, London Flag.

Lettuce: Great Lakes.

Parsley: Curled types.

Parsnip: Hollow Crown, Student.

Peas: Greenfeast.

Radish: French Breakfast, Long Scarlet.

Spinach: Round-seeded.

Turnip: Golden Ball, Early White Milan.

Plants of the following may be set out.—

Asparagus of the varieties mentioned above without delay.

Globe artichokes.

Summer cabbage in the south.

Cauliflowers in the south.

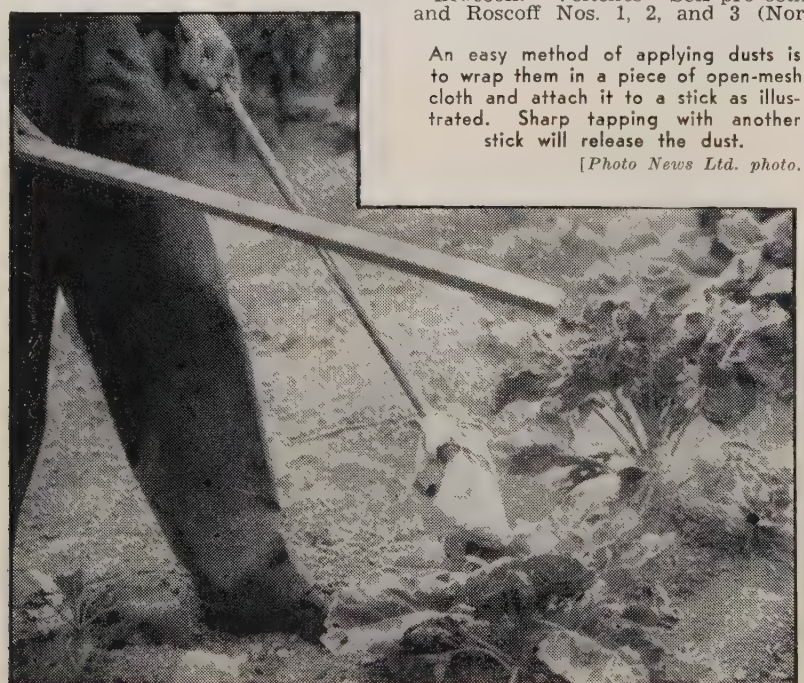
Kumaras if frosts are past.

Onions of main-crop varieties in late districts.

Lettuces of summer varieties.

Potatoes of main-crop varieties.

Silver beet seedlings.



An easy method of applying dusts is to wrap them in a piece of open-mesh cloth and attach it to a stick as illustrated. Sharp tapping with another stick will release the dust.

[*Photo News Ltd. photo.*

Sugar Beet as Winter Supplement for Pigs

RECENT advances in prices for pork and bacon make pig keeping a profitable part of dairy farming, but high prices do not eliminate the seasonal variation in the supply of separated milk or whey. There is still a winter period of about 3 months during which sows and late-autumn litters require supplementary feed to keep them in condition until the spring calving again supplies separated milk.

The cheapest method of supplying the needs of sows and stores through winter is by growing a small area of roots. Where soil conditions are suitable sugar beet is one of the best crops for this purpose. The yield varies from 15 to 30 tons per acre. There is no waste, as the leaves are palatable and the crop can be pulled and fed as required. For wintering for 3 months a sow needs about 2 tons of roots and a store about ½ ton. Half an acre well manured and cultivated will supply the needs of four or five sows and their autumn litters.

Sugar beet, though palatable and high in sugars, is deficient in protein, and unless it is fed with a protein supplement such as meat meal its feed value is greatly reduced. In-pig sows should receive 1½lb. of meat meal a day with about 30 to 40lb. of sugar beet. Store pigs should receive ½ to 1lb. of meat meal a day, with about 8lb. of roots for a 60lb. store, the quantity being increased to 19lb. for a large store weighing 100lb. If meat meal is not available, pea meal, linseed meal, or any proprietary concentrate containing a good percentage of protein should be used, for without some concentrate root crops are not satisfactory for wintering pigs.

—C. E. BALLINGER,
Instructor in Agriculture,
Department of Agriculture,
Whangarei

The Basis of Disease Prevention on the Poultry Farm

MUCH attention has been paid to the essential nature of good management and nutrition in combination with good hygiene, housing, etc., in this series of articles by J. J. Thompson, Veterinarian, Department of Agriculture, Wellington, on the basis of disease prevention on the poultry farm, of which this is the third, the previous two having appeared in the May and August issues. To prevent most diseases it is not necessary to use drugs or other artificial means of control. It requires organisation of the labour available on the farm to the best advantage in keeping the birds in good health and production by employing the measures advocated as fully as possible.

MOST disease outbreaks are the result of a breakdown of some part of the work programme; in some instances from adventitious events, but for the most part due to human error or lack of foresight. Risks must sometimes be taken, particularly on large poultry plants, but normally it is a comparatively straightforward job to maintain close attention to the requirements of the flock to keep them healthy. The final article will deal with the measures which should be undertaken to control an outbreak of disease in the poultry flock.

There is no easy way to freedom from disease. However expert the adviser on such matters may be he must still insist on the same principles which have been urged for years—good diet, good hygiene, good housing, and good husbandry. There are no substitutes. So-called wonder drugs have been elaborated in recent years which are of great value in the control of certain diseases, but no research worker on the subject has ever suggested that these can be substituted for sound management. They are reserves which help to reduce the odds in the battle against disease.

The articles in this series have reached the point of rearing poultry on range. At this stage there may be a tendency on the part of the poultry keeper to relax and feel that because he has successfully reared the birds so far, nothing much can happen before they reach the laying house, but the foundation of good laying birds is still to be completed. It is surprising how quickly a good batch of pullets can break down into a disease-riddled flock through mismanagement.

The following are a few of the possible causes of breakdown:—

Worms and duodenal coccidiosis, arising principally from overcrowding, poor, badly drained range, and poor feeding, especially lack of vitamin A.

Colds, contagious catarrh and chronic fowl cholera, fowl pox, and blackhead are closely linked with poor feeding, overcrowding, poorly ventilated housing, and lack of shelter on range.

It is impossible to eliminate entirely the bacteria or parasites which give rise to these diseases. The disease-control programme on the farm must therefore be concentrated on two methods of attack, as follows:—

1. **Reducing the concentration of parasites or bacteria** to which the birds are exposed as far as is practicable by good hygiene, that is, clean, disinfected equipment and houses, and clean range conditions, and by culling the poor, sickly, or unhealthy birds which are "incubators" of disease and serve to build up the amount of infection present.

2. **Building up the bird's reserves against infection** and promoting its resistance to disease by good environment, which means efficient management, that is, no overcrowding, provision of good balanced feedstuffs, and conditions of housing. Any sudden change in feeding, deficiency in the diet, or lack of shelter from adverse weather conditions may be sufficient to precipitate an outbreak of one of the diseases mentioned.

These are the first essentials of disease prevention, and no poultry farmer can afford to waive them. To this programme of control there can be added certain necessary measures which are of value.

Deworming: White Leghorns are the predominant breed of birds in New Zealand. They are more susceptible to infestation by the large roundworm than any other breed. For this reason it is strongly advised as a worthwhile precaution that they should be dewormed at 8 weeks and again at 12 weeks. Carbon tetrachloride is very efficient, and the dose recommended is 1 c.c. at 8 weeks and 2 c.c. at 12 weeks. The birds should be starved for 18 hours before dosing.

Fowl pox vaccination: This procedure is advised only in districts in which the disease is endemic, for example, in the Auckland area on farms which suffered an attack in previous years or which through the presence of the disease on neighbouring farms may be exposed to infection. The birds should be vaccinated at from 8 to 12 weeks.

The vaccine should be used only on healthy birds. If the birds are in poor condition from heavy worm infestation, etc., the use of the vaccine will tend to cause a further setback.

Use of drugs: A number of drugs are now available which have advanced greatly the ability to control outbreaks of coccidiosis. As a cure, they must be used as soon as possible after the first evidence of the disease is observed. Sulphaquinoxaline is promising in the treatment of duodenal coccidiosis if used in the early stages.

As a preventive measure, sulphaquinoxaline, nitrophenide, and nitrofurazone offer a high degree of protection, but their use is warranted only on commercial farms which are raising large numbers of chicks or on which outbreaks of either caecal or duodenal coccidiosis have been experienced over a number of years. It must be emphasised that the use of drugs is not a substitute for good management but an additional safeguard.

The Laying House

The laying house must be thoroughly cleaned and disinfected before the pullets are brought in from the range. Good ventilation is essential. Many outbreaks of colds can be traced to the removal of pullets from conditions

Bird being dosed for roundworms with carbon tetrachloride.

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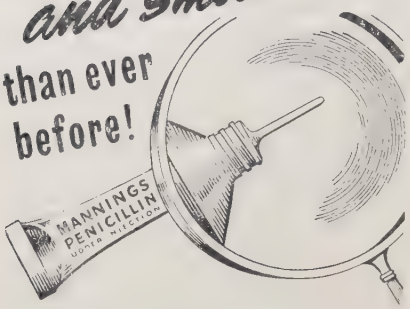

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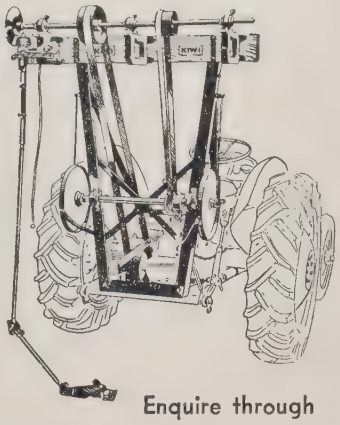

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of open range to a stuffy, poorly ventilated laying house. The walls of the house as far as possible should be smooth, and the fewer crevices and joints there are the less risk there is of an infestation later on with red mite. The perches also must be constructed to have as few hiding places for red mite as possible, such as concealed joints. A case of this type was observed recently on a farm which maintains a high standard of hygiene and sanitation. Red mite found on the perches was apparently eliminated by using a benzene hexachloride preparation. Despite the efficiency of the insecticide, a fresh infestation was found in many of the houses within 2 months. Close inspection of the houses revealed covered-in portions of the walls which presented ideal hide-outs for the blood-sucking parasite.

Had these closed-in areas been left untreated, reinfestation of the houses would have occurred continually over a long period. A proportion of the birds in some houses showed white combs and faces as the result of the parasitic attack. An invasion of red mite is frequently unnoticed until well advanced, and egg production and the health of the birds will suffer unless thorough treatment of the house is undertaken to clean it up.

Ventilation: Unless a good supply of fresh air circulates through the laying house, the risk of colds and other respiratory conditions is greatly increased. It is difficult to keep the litter dry if ventilation is inadequate, and the condensation of moisture reacts adversely on the walls, roof, and fittings.

Ventilators at floor level are the most efficient. If the water trough is built outside the front wall, the space underneath should be left open and covered only by wire netting. The open space at the back of the roof commonly used is useful, but too often it is covered over unnecessarily by a back board which greatly reduces its value.

The provision of a panel on the side, front, or back of the house which may be left open in good weather is worthy of consideration.

Whatever method of ventilating the house is used, the supply of fresh air at floor level should be ample for the birds at all times. A smoke test may be applied when the house is empty to check on the air flow through the house.

Litter: Good litter must be dry and sufficiently deep and absorbent to dilute the droppings and render them harmless. Dampness, whether from outside sources such as roof leaks, from water troughs, or from the droppings, encourages the survival of parasites. Outbreaks of duodenal coccidiosis in the laying houses are often the result of damp litter which has not been built up sufficiently to absorb the droppings.

The establishment of a good built up litter requires care. Any caked up areas must be broken up with a rake and if very bad, removed from the house. Frequent stirring of the litter is also necessary, and the use of hydrated lime at 10lb. per 100 square feet of litter is a valuable method of drying damp litter. The lime should be well stirred into the litter, and it may be necessary to use it more than once in some cases at intervals of 6 to 8 weeks.

[*Fraser Niederer photos.*

Above—Perches should be built to counteract red mite infection. Iron piping makes useful supports. The back of this house is of poor construction with too many crevices in which red mite may hide. A smooth impervious lining is much better. Below—Timber joints of this type on the perches provide additional hiding places for red mite.

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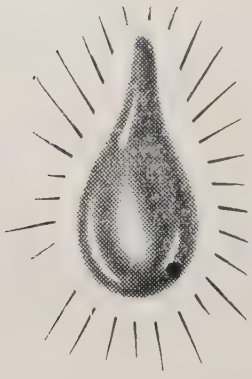

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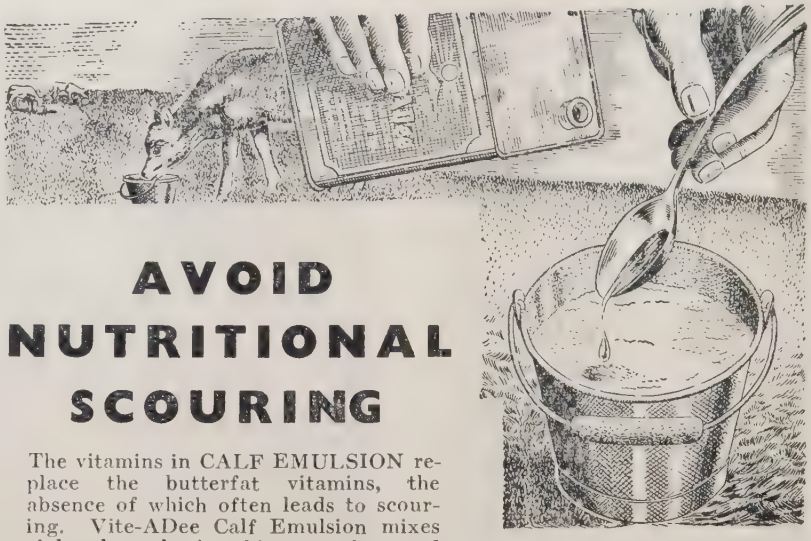

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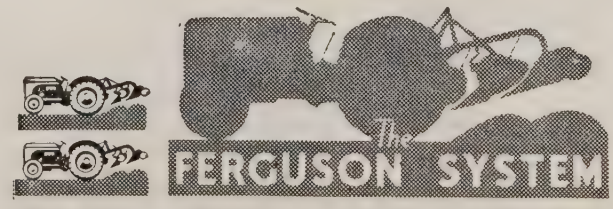

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The minimum allotment of 4 square feet of floor space per bird in a house is important, and if this is cut down, it leads to overcrowding, which is the primary predisposing cause of many diseases. It is impossible to stress too much the evils of overcrowding birds under the intensive system. If the birds have a run out on range, or if the house is a very large one, 3½ square feet of floor space may be sufficient, but this does not apply on many farms in New Zealand.

Underfeeding which results in poor egg production is often caused by insufficient feeding space at the troughs or hoppers. Feather picking and cannibalism are sometimes initiated by this fault. At least 20ft. of feeding space should be available per 100 adult birds.

The interior of the house should be light. This appears to be a factor in stimulating the birds to lay. A dark interior arising from insufficient window space or spraying with creosote for preservative purposes encourages external parasites including lice and red mite. Vices such as cannibalism and vent picking also occur more often in houses with dark surroundings.

A useful type of ventilation, provided the wire screen between the top plate and the rafters is not allowed to become blocked with feathers.

Feeding

Good nutrition is an important safeguard against disease. There are two principal objects in supplying a balanced diet to laying birds. They are:—

To enable the bird to grow properly, to provide for the daily expenditure of energy, and to maintain resistance to disease.

To provide a surplus sufficient to meet the demands of egg production.

If the diet is insufficient or unbalanced, the young pullet will continue to lay for some time at the expense of its body requirements until all the reserves are used up. Poor growth and a diminution of the natural resistance to disease will follow. Eventually egg production will cease entirely.

In this country the provision of standard mashes and wheat simplifies greatly the preparation of a balanced diet. It is essential only to ensure that the total feed provides a minimum of 15 per cent. of protein, sufficient vitamin A in the form of greenfeed and/or fish oil, and that the mash contains 1 per cent. of salt. Soluble grit such as oyster shell and ground limestone and a hard flint grit should be provided. The average diet of equal parts of wheat and mash calls for a mash containing 20 per cent. of protein in order to provide a total of 15 per cent. of protein in the mash. Advice on problems of feeding is available from Poultry Instructors of the Department of Agriculture.

The poultry farmer should remember that his entire income from the birds may be dependent on an adequately balanced diet.

Water supply is also of great importance, but there appears to be little need to stress this in New Zealand, since the arrangements on most farms are satisfactory. Water and mash may act as mechanical carriers of bacterial disease and, as a measure of good hygiene, the food and water troughs should be cleaned out at frequent intervals to ensure that they do not spread disease germs. Stale mash should not be left in the trough to be covered up by the next day's supply; otherwise moulds and fungi tend to form which may establish in the birds' digestive tracts.

Culling

Frequent inspection of the laying house is necessary to ensure that the first signs of disease are observed. Sick or ailing birds must be removed immediately to safeguard the remainder. A knowledge built on experience of disease outbreaks teaches that prompt measures of culling in the earliest stages often reduce loss by cutting out potential sources of infection. Attempts to treat individual diseased birds are seldom worth while, and so long as a diseased bird remains alive it is a menace to the remainder of the flock. If the condition or disease appears to be spreading, it is wise to seek advice on control at an early stage so that radical methods may be adopted which will cut short the course of infection in the flock.

Two other precautions should be mentioned. New birds should never be introduced directly into the flock, but should be kept separately in other quarters for 3 weeks. Similarly birds which have been at shows should be quarantined on their return in case disease is introduced into the flock. Stock of different ages must never be allowed to mix. Older birds are often carriers of disease which if conveyed to young pullets, may spread quickly, with damaging effects and possibly heavy mortality. This applies particularly to respiratory diseases.

Breeders

In an earlier article in this series the effect of proper feeding and management of breeders on the progeny was discussed. One of the best methods of controlling losses in young chicks is to ensure that they have a good start in the early stages. Apart from genetical factors, nutrition of the breeder is of great influence.

Feeding

The diet of the breeding bird should be similar to that of the laying bird with a few adjustments, as follows:—

The breeding bird requires a higher concentration of vitamin A in the feed to ensure that an adequate amount is passed on to the chicks. It is advisable, therefore, to use a fish liver oil supplement in addition to greenfeed.

An invaluable addition to the diet of breeders is 5 per cent. of milk powder. It supplies riboflavin and other necessary vitamins. The mineral content and complete nature of the protein contained in milk powder serve to guard against deficiencies which may upset hatchability or the rearing quality of the chicks.

Access to good range with succulent pasture also provides the breeders with nutrients which are not always available in the diet. If it is not possible to provide suitable pasture and the birds are kept intensively, a supply of fresh young greenfeed is essential.

The dietary factors mentioned should be regarded as minimal requirements for good hatchability and rearability in the progeny.

Blood testing of the breeding stock is necessary for the control of pullorum disease. Severe outbreaks have not been very frequent in New Zealand, principally because of the rapid expansion of the blood testing programme undertaken by the Department of Agriculture and the natural resistance of White Leghorns to pullorum disease.

Heavy breeds such as Australorps or Black Orpingtons, which are becoming increasingly popular, are much more susceptible to pullorum disease, and increased care is required to ensure efficient control in flocks.

Care of Belt Drives

SUCH a number of different types of belts are employed on modern farm machinery that it is to the farmer's advantage to know a little about their care. The main points are given in this article by D. F. Scott, Machinery Instructor, Department of Agriculture, Auckland.

BELTS correctly used form a very convenient and efficient means of transmitting power, but their efficiency falls off very markedly under a number of conditions.

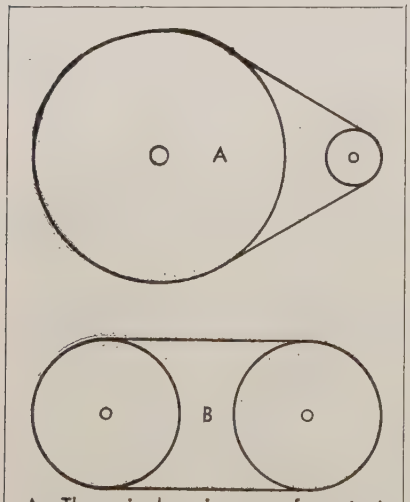
Belt too loose: This allows it to slip, lowering efficiency; the heating that can occur under these conditions is very destructive to belts and under extreme conditions may be the cause of fire.

Belt too tight: Here the damage is caused both to the belt and in time to motor and machine. Very tight belts place a strain on bearings and also increase losses due to friction. Tension should be adjusted so that there is sufficient to prevent slip but no more. A belt run too tight will soon develop breaks in the fabric and eventually will break altogether.

Pulleys out of line: Where flat belts are used the belt will not stay on under load, but with V belts the result is accelerated wear and shorter belt life.

Oil on belt: Where machines are over-lubricated or oil seals are faulty belts often become soaked with oil. Where the belts contain rubber, mineral oil causes very quick deterioration and care should be taken to see that such belts are kept free from lubricating oils.

Use of too small a pulley: This can lead to trouble in a number of ways. Where a very small pulley is used in conjunction with a large one and the distance between centres is not great the arc of contact between belt and small pulley is reduced, so that much more belt slip takes place. Because the size of pulleys is governed by the number of revolutions required to be developed at the driven point, significant variation in the size of pulleys may not be possible; the alternative is then either to change the type of belt or to have the transference of power from the driver to the driven point broken down by an intermediate pulley on another spindle.



A—There is loss in arc of contact when there is a big difference in pulley sizes and pulleys are close together. B—The arc of contact is approximately 180 degrees where pulleys are of similar sizes.

Because of the fact that the smaller the pulley the more the belt is flexed as it passes round, and the more the belt is flexed the quicker it heats and wears out, makers stipulate a minimum pulley size for any particular size of belt. The minimum pulley size increases as the cross-sectional area of the belt increases. Because of this it is customary where it is necessary to have a small pulley on a machine to use two or more small-section V belts instead of one large-section belt. Small pulleys can also cause trouble with belt fasteners of flat belts. It is often found that where a small pulley is used it is best to use an endless flat belt, as most belt fasteners give trouble, or V belts. Belt fasteners cannot bend to the arc of circumference of small pulleys and tend to tear out of the belt.

Types of Belts

Belts are made of canvas, leather, rubberised fabric, and plastic and leather combined. Each of these materials has its advantages for different uses and all require some care.

Canvas belts are made of specially treated canvas and will stand up to hard work and abuse and for that reason are widely used on farms. They have the disadvantage that they stretch in dry weather and shrink in damp weather; however, they are quite satisfactory for use between tractors and saws or mills where the tractor can be backed to tighten the belt. Canvas belts can be treated occasionally with castor oil or raw linseed oil.

Leather belts are the most expensive and are generally considered the best, provided they are used under suitable working conditions where they are not likely to be affected by moisture, steam, or oil. For that reason they are not the most suitable for farm use. Leather belts should be kept clean and given an occasional dressing of neat's-foot oil. These belts should always be fitted so that the smooth side is next to the pulleys.

Rubberised-fabric belts are very popular for farm machinery either as flat belts or, more often, V belts. As they are quickly damaged by mineral oil, which rots the rubber, great care should be taken not to over-lubricate adjacent bearings. Rubber belts should not require dressing, but should be kept clean by washing them in soap and water. A light dressing of castor oil can be used. Between seasons rubber belts should be removed from machines, cleaned, and kept in a cool, dark place.

Plastic and leather belts are designed to stand up to very hard work. High belt speeds and shock loads seem to have little detrimental effect. This type of belt can be joined without the use of a conventional belt fastener, but is not often used on farm machinery.

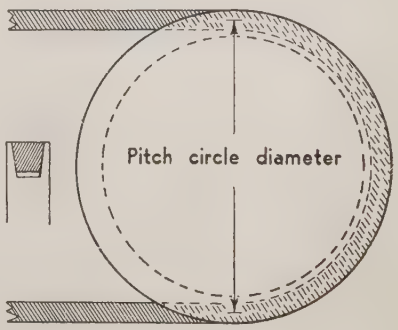
V Belts

V belts are designed to take all the drive on their sides and the inside edge should not come in contact with the bottom of the pulley groove. Where this happens a belt will in time become frayed and cracked on the inside.

V-flat drives: Drives from a V belt on to a flat pulley are efficient when the speed ratio is 3 : 1 or more and the larger pulley is the flat one and the smaller the driver. Here the belt works at a higher tension so will not last so long. The face of the flat pulley should not be crowned, that is, it should be perfectly flat.

Pitch Circle Diameter

Because V belts take the drive on their sides, an accurate measurement of pulley diameter can be made only across the pitch circle and is known as pitch circle diameter. This is the diameter of the pulley measured from centre to centre of the belt in the groove on either side.



This diagram shows how the pitch circle diameter is measured. The cross-section of V belt and pulley at left shows the correct position of the belt; it does not touch the bottom of the groove in the pulley.

V-belt-pulley ratios are calculated as for flat belts except that the pitch circle diameter of the pulleys is taken instead of the full diameter. With a V-belt-pulley to flat-pulley drive the ratio would be the relationship of the pitch circle diameter of the V-belt pulley to the full diameter of the flat pulley.

CHANGES OF ADDRESS OF "JOURNAL" SUBSCRIBERS

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Keds, Lice, and Mites in Sheep

By E. A. PRATT, Veterinarian, Department of Agriculture, Oamaru

ALL sheep owners are aware that external parasites of sheep exist in New Zealand and that they are required to dip their sheep at certain times of the year. However, not all farmers have much knowledge of these parasites, their habits and life cycles, why dipping is necessary, and why it should be carried out on a national basis.

EXCLUDING the blowfly, three types of parasites are active in New Zealand. These are keds (commonly called "ticks"), lice, and mites. All are capable of causing considerable loss and damage, and a knowledge of their life histories, symptoms of their presence in sheep, and treatment will help farmers in either eradicating them or keeping them at very low levels.

Keds

Probably the most widely known external parasite of sheep in New Zealand is the ked (*Melophagus ovinus*), which is actually a wingless fly. It has 6 legs, whereas the true tick, which is related to the spiders, has 8 legs. This differentiation is necessary, since the life cycles of the two parasites are entirely different. This has an important bearing on control. True ticks occur in New Zealand and the cattle tick (*Haemaphysalis bispinosa*) sometimes affects sheep, but rarely causes much trouble.

Life Cycle and Habits

The ked, which is a stout, leathery, brownish parasite about a ¼in. long and is easily seen when the fleece of "keddy" sheep is opened, is widespread throughout New Zealand. Adult keds have a life on sheep of some 80 to 100 days, but will survive only about 5 days off sheep. In 6 to 13 days after copulation, depending on the age of the female, reddish brown pupae are produced and are attached to wool fibres by a sticky substance. The pupae are generally found under the neck or the lower parts of the body of sheep, a short distance up the fibre from the skin. They are therefore nearly all removed at shearing, and may under favourable conditions survive up to 6 weeks in shorn wool. After about 3 weeks the pupae hatch and in about another 2 weeks the newly hatched ked will be producing its own pupae. It will be seen later, when control and dipping are being considered, that these times in the life cycle are important.

Sheep ked.

As the mature female deposits pupae at about 1 per week, multiplication of the ked is comparatively slow, each female giving rise to only 10 to 12 pupae. They feed intermittently by piercing the skin and sucking blood.

Nutrition and condition of sheep play an important part in the degree of ked infestation. Infestations generally decrease during summer, probably because of the better climatic and feed conditions during spring and summer and also to spring shearing. This seasonal change may be misleading in assessing the effectiveness of dipping. Young sheep, old sheep, and those in poor condition or heavily infested with internal parasites are more predisposed to build up heavy ked infestation. Also British breeds of sheep seem to be more susceptible than Merinos, most likely because of the more open fleece of the former.

Effects

The harmful effects of high ked infestations are first, the fact that it is a blood sucker and causes considerable irritation and loss of condition, and secondly, the detrimental staining of wool which may lower its value markedly. Lightly affected sheep may show no symptoms apart from slight staining of the fleece.

Fleeces of sheep infested with lice become ragged and if infestation is heavy, there may be a break in the wool.

Lice

Lice are small, wingless insects with short legs which live as permanent parasites on animals and birds. Three different species of lice affect sheep in New Zealand; two are found on the body and one affects the hairy parts of the legs. One of the first two is a biting louse (it feeds from biting the skin) and the other two are sucking lice (they have mouth parts adapted to piercing the skin and sucking blood).

Body Louse (Red or Biting Louse)

The most common louse is the body louse (also biting louse or red louse—*Damalinia ovis*), which feeds on the skin and yolk, causing intense irritation. It is a small, reddish brown louse found close to the skin. Usually a good light is needed to see them readily (a hand lens is an aid) and they are generally found along the back and sides of the animal. The eggs are found attached to the wool fibres close to the skin.

Life cycle: The life cycle is as follows: The eggs take about 10 days to hatch and then the larvae pass through three different stages before becoming adults about 3 weeks after hatching. They are then capable of depositing eggs 3 days later. The whole cycle from egg to egg thus takes about 5 weeks. Mature female lice are capable

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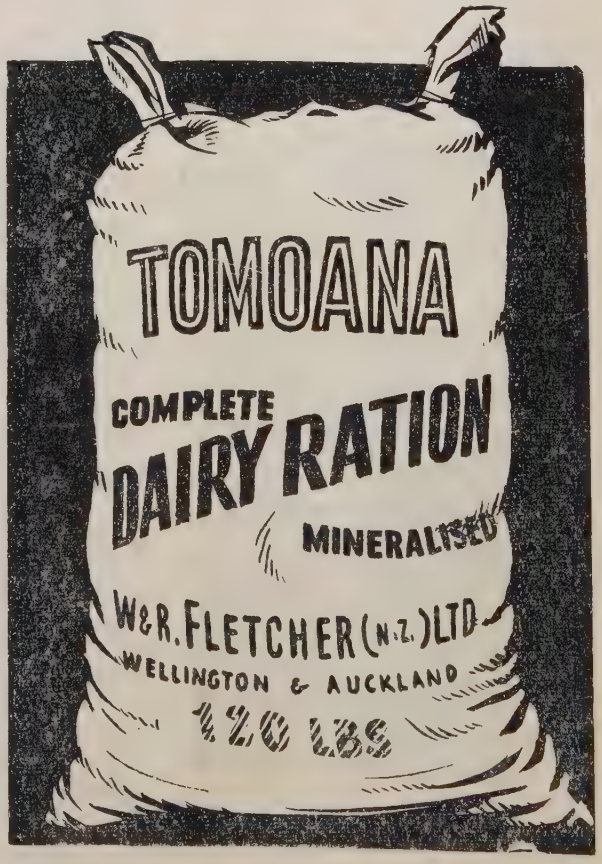


of producing 2 eggs every 3 days under favourable conditions and so heavy infestations with lice are much more rapidly built up than are infestations with the ked. Since the lice and eggs are close to the skin, shearing will not remove many of them, but it will expose them to unfavourable conditions and make them more accessible to dipping fluids.

Biting louse.

Infestations of lice, like those of keds, have a seasonal fluctuation, being heavier in winter and lighter in summer, the reasons being the same in both cases. Lice tend to decrease when sheep are kept on a high plane of nutrition.

Effects: The effects on the sheep are marked irritation (causing animals to scratch and rub), loss of feeding and resting time, and hence unthriftiness. Fleeces become ragged and in heavy infestations there may be a break in the wool. Generally, however, infestation builds up because of the poor condition of sheep; it is not the lice that cause the poor condition—hence the importance of healthy, well-fed stock.

Blue Louse (Body Louse, *Linognathus ovillus*)

The blue louse, a sucking louse, is not very common in New Zealand. Its life cycle is similar to that of the biting louse, but it is usually found in clusters or colonies on various parts of the body. Females lay large masses of eggs from the clusters, which mat the wool and skin together.

Leg or Foot Louse (*Linognathus pedalis*)

The third louse causing trouble in New Zealand is the foot or leg louse, which is a blue sucking louse much larger than the biting louse. It is almost entirely confined to the hairy, non-woolled parts of the body, around the coronet and fetlock, and the end of the purse in rams.

Leg louse.

Life history and effect: The life history of the foot louse is somewhat similar to that of the biting louse—eggs hatch after 17 days and young lice reach maturity and produce eggs about 26 days later. Detection of foot lice may be difficult because of their being obscured by mud and debris about the feet. Lambs may become infested at an early age by close contact with affected mothers, or the lice may drop off on to pastures and be picked up by other grazing sheep.

Symptoms of infestation are not always readily observed, but biting and stamping of the feet are the most obvious ones. Care should be taken, however, to differentiate foot lice infestation from leg mange.

Leg Mange (Chorioptic Mange)

The external parasite known as a mange mite (*Chorioptes bovis* var. *ovis*) cannot be seen with the naked eye, but can be diagnosed by microscopic examination of skin scrapings from affected parts. It belongs to the same family as the mite which causes scabies in humans and other animals.

The parts of sheep affected are mainly the lower hairy parts of the legs and the bottom of the purse in rams or udder in ewes. Sometimes mange is transferred to the hairy areas around the mouth by the sheep biting their itchy legs. Generally sheep do not become lame, but the irritation caused by the mites in the superficial layers of the skin make the sheep stamp and bite their feet. The mites cause the formation of thick, scurfy scabs in the hair overlying raw patches

Leg mange mite (*Chorioptes ovis*).

on the hairy parts of the legs and purse. Often in prolonged cases the skin becomes thickened. If the scrotum in rams is involved, it may be possible for fertility to be affected. Again, like ked and lice infestations, the condition occurs mainly in autumn and winter and tends to clear up in spring and summer.

Control and Treatment

Treatment and control of all the external parasites mentioned are generally along the same lines and the ultimate aim should always be eradication. There are many practical difficulties confronting eradication programmes, but a knowledge of the life histories and seasonal incidence of the offending parasite or parasites must help.

It must always be remembered that economic losses from these parasitic diseases occur not only from their detrimental effects on sheep, but from time and expense incurred in dipping, etc. This latter is perhaps the most important reason why a national eradication scheme should be undertaken, and this is possible only with the wholehearted support of every farmer in New Zealand.

Control of Keds

Their life history shows that keds may be in the pupal form for about 3 weeks before hatching. As pupae they are remarkably resistant to all types of dip at present in use, but as adult forms they are susceptible to most. Thus pupae deposited just before dipping will have a good chance of surviving unless the dip is capable of remaining toxic in the fleece for at least 3 weeks. Shearing will remove most of the keds and pupae, and many of those remaining will drop off or die because of the unfavourable fleece conditions.

Therefore the best time to dip is as soon after shearing as possible; that is, when shearing wounds have had a good chance to heal. At least a week should elapse between shearing and dipping. The ideal dip would be one that remained toxic in the fleece long enough to kill all the pupae deposited just before dipping time as they emerge as adults. The newer D.D.T. and "Gammexane" dips are much more effective in this respect than any other of the common dips, and the fleece will probably remain toxic for the required period, provided the concentration of the dip is maintained. Both D.D.T. and "Gammexane" are fluid suspensions, which become weaker as more sheep are put through the wash and so more concentrate should be added periodically to keep the concentration up to the required level until the last sheep is dipped. If the dip is not replenished at frequent intervals, it will be ineffective and the cost in labour and expenditure of the dipping operations will have been wasted.

Probably two dips at about 18- to 21-day intervals would be required to make sure of killing all the pupae.

Eradication and control measures usually break down for the following reasons:—

1. All the sheep are not dipped at the same time, or infested strays and stragglers left behind become a source of reinfestation.

2. Dipping procedure is not carried out efficiently; sheep are not properly wetted, dipping is too hurried, or the concentration of the dip is allowed to get too low.

"Gammexane" and D.D.T. are fairly effective even if dipping is not done efficiently. Of the other common dipping fluids arsenic is not very effective against keds. It has the advantage

of being cheap, but the disadvantages of being poisonous and causing scald if the sheep are dipped without sufficient resting.

Derris dips are effective against keds, but unlike D.D.T. or "Gammexane" have little lasting effect in the fleece and so are ineffective against the pupae which hatch out a few days after dipping.

Control of Lice

The biting louse (*Damalinia ovis*) and the blue louse (*Linognathus ovillus*) can be eradicated and controlled in much the same way as keds, but lice multiply much more rapidly than keds, and if control breaks down, heavy infestations will build up much more quickly than with keds. Control measures must be thorough. Of the dips used arsenic is very effective, but dipping must be repeated at 14- to 16-day intervals to eradicate the lice.

As arsenic does not kill the eggs and does not remain toxic in the fleece for very long, repeated dippings are necessary to kill the larval forms as they hatch from the eggs about 10 days after they are deposited. "Gammexane" is more efficient in this respect, as it remains at toxic levels in the fleece long enough to kill the larvae as they hatch. Derris dips are not very efficient for lice. As with keds, dipping should be carried out as soon after shearing as is considered safe to allow better penetration of the dip fluid and a better kill. The same control breakdowns occur with lice as with keds, but results are seen much more rapidly.

Additional factors complicate the control of the foot louse. It does not appear to be as susceptible to some of the dip fluids used and very often the lice around the legs of sheep are protected by mud, burrs, grease, etc., and may not be properly wetted by the dip fluid. "Gammexane" dips are probably the best, but dipping often will have to be repeated.

Control of Mange

The protection afforded by mud, etc., also affects the control of leg mange, and ordinary dipping is probably not very effective. A deep foot bath is suggested as the best method of treatment; a bath deep enough to cover all the hairy parts of the legs. Hand treatment of rams and ewes which are affected on the purse or udder is necessary to ensure a thorough application of the dressing. The mites are generally well protected by scurf, etc., and it is best to keep the animal's legs in the foot bath as long as is convenient.

Ordinary dipping strengths do not seem strong enough to control mites and use of "Gammexane" at about 10 times normal strength is advocated. Treatment should be repeated at weekly intervals for 2 to 4 weeks. Lime sulphur is also fairly effective in treating cases of leg mange. A dressing for applying to isolated cases may be made by thoroughly mixing 8 parts of either neat's-foot oil, lanoline, or cod liver oil with 1 part of ground flowers of sulphur. The dressing should be well rubbed in to affected parts at weekly intervals.

These suggestions for treatment of leg mange are not always successful, and further work on efficient control and eradication will be required before definite recommendations can be made.

Eradication Possible

The aim of all control programmes against the external parasites referred to in this article should be complete eradication. As some very good insecticides such as D.D.T. and "Gammexane" are available and a fairly good knowledge of the life cycles and habits of the parasites occurring in New Zealand has been gained, conditions are favourable for eradication. Success rests with the sheep farmers.

Meteorological Records for July

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum					Amount	Date	
Kerikeri	201	50.1	— 0.4	64.6	31.0	1.31	14	— 6.08	0.44	19	130.9
Auckland	160	50.6	— 0.8	61.3	36.9	3.93	9	— 1.53	2.17	5	116.8
Tauranga	10	46.8	— 1.9	63.2	27.9	2.12	8	— 2.92	0.94	19	196.8
Ruakura	131	44.1	— 2.4	59.2	24.8	2.41	8	— 2.32	0.91	19	143.2
Rotorua	969	43.6	— 1.6	58.6	27.8	1.70	7	— 1.94	1.41	13	178.2
Gisborne	12	46.4	— 1.8	67.5	26.6	1.18	13	— 2.23	0.53	9	155.2
New Plymouth	160	47.4	— 1.5	58.0	33.2	3.47	12	— 2.89	1.70	19	158.8
Napier	5	46.8	— 0.5	66.9	28.8	0.65	7	— 2.88	0.37	19	183.9
Karioi	2125	39.6	— 0.8	56.0	23.0	2.44	13	— 1.85	0.55	19	
Wanganui	72	45.6	— 2.0	59.1	30.2	1.33	8	— 1.39	0.61	6	150.3
Palmerston North	110	44.2	— 1.9	59.0	27.6	1.88	8	— 1.18	0.53	6	136.8
Waingawa	340	42.5	— 2.0	60.0	25.0	1.96	15	— 1.98	0.37	6	151.1
Wellington	415	46.0	— 0.3	55.9	33.3	2.39	10	— 2.97	0.86	8	124.8
Nelson	5	40.9	— 2.4	56.2	25.0	1.29	5	— 1.94	0.68	19	226.5
Blenheim	12	43.1	— 1.5	60.3	27.0	1.60	6	— 1.01	0.86	6	230.8
Hokitika	12	42.5	— 1.1	54.9	28.3	4.92	7	— 3.58	1.59	18	148.1
Hanmer	1270	36.7	— 1.8	57.2	20.0	2.22	6	— 1.98	1.14	7	157.3
Christchurch	22	41.4	— 0.9	60.3	25.8	1.15	9	— 1.45	0.42	20	175.7
Ashburton	323	40.3	— 0.8	63.4	23.2	1.15	7	— 1.47	0.44	7	177.7
Timaru	56	38.6	— 2.8	60.4	23.8	0.49	4	— 1.24	0.21	8	159.8
Alexandra	520	35.3	— 1.1	58.9	18.8	1.00	3	+ 0.34	0.61	19	124.2
Taieri	80	39.6	— 1.4	59.7	21.0	1.90	11	— 0.04	0.60	19	108.1
Invercargill	8	41.6	— 0.1	59.2	25.1	1.49	15	— 1.48	0.39	1	98.6

Government-approved Turnip and Swede Seed

VARIETIES of turnips and swedes Government-approved seed of which was being distributed for sowing in the 1951-52 season were listed in the August 1951 issue of the "Journal". Seed of the same varieties is now being distributed for sowing in the 1952-53 season, the containers being branded with the identification letter S.

The complete list of varieties is:—

Swedes

*N.Z. Superlative
*N.Z. Grandmaster
N.Z. Crimson King
N.Z. Sensation
N.Z. Calder
N.Z. Wilhelmsburger

Yellow-fleshed Turnips

*N.Z. Purple Top Yellow
N.Z. Purple Resistant
N.Z. Waites Eclipse
N.Z. Green Top Yellow
N.Z. Green Resistant
N.Z. Victory Yellow
N.Z. Champion Hybrid

White-fleshed Turnips

N.Z. Green Globe
N.Z. Red Globe
N.Z. Purple Globe
N.Z. York Globe

Seed of most of the varieties has a germination of over 90 per cent., but the seed of varieties marked with an asterisk above has the following germinations:—

	Per cent.
N.Z. Superlative swede ..	88
N.Z. Grandmaster swede ..	87
N.Z. Purple Top Yellow turnip	85

BOOK REVIEW

"Maori Houses and Food Stores": W. J. Phillipps

THE author of this Dominion Museum Monograph (No. 8) has been ethnologist of the Dominion Museum since the retirement of the late Elsdon Best. He has presented a wealth of material on the types of dwellings used by former Maori populations of New Zealand and on their food stores. There are more than 130 illustrations in a book of 212 pages that makes an important contribution to study of the way of life of the Maori before European settlement in New Zealand.

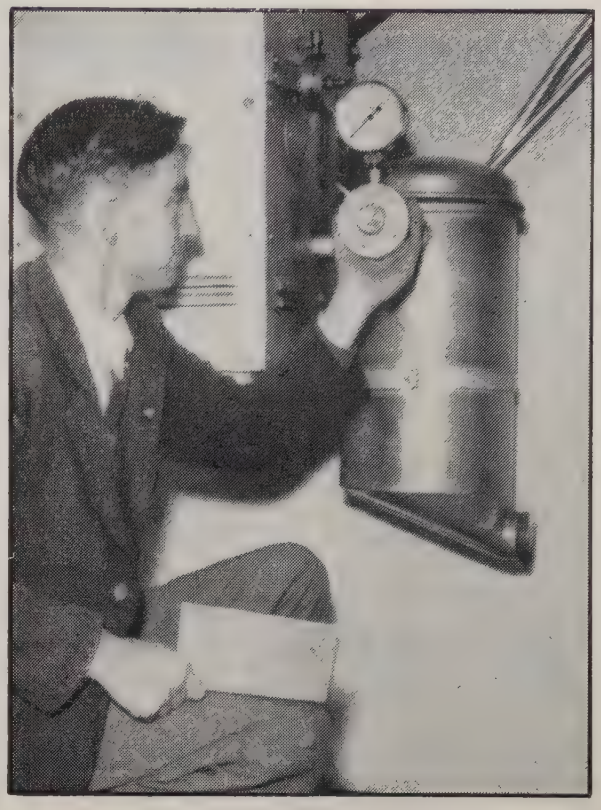
Produced on art paper and with an attractive dust jacket and coloured frontispiece, the book makes a most pleasing impression, which is somewhat impaired by errors and printing lapses. Haphazard sizing of blocks and their placing in many instances some distance from text references and the wrong way on the pages are regrettable when the author has gone to obvious pains to assemble a collection of great range and historical interest.—*G.J.N.*

The Government Printer, Wellington. 18s.

Air-flow Meter for Testing Milking Machines

THOUGH in the milking machine the "vacuum" is the fundamental working force, the relation between vacuum and air flow in the various parts of the machine is only very poorly understood. The vacuum in the machine is in fact only a partial vacuum, so that the machine is filled with air at a pressure below normal atmospheric pressure (actually half of atmospheric pressure at 15in. mercury vacuum). This means that the vacuum levels in the machine, which determine its whole action, are completely decided by the very rapid flow of this air in the machine. Air is continuously flowing from air inlets on the machine through the pipes to the vacuum pump, which forces it out into the atmosphere again. It is not surprising then that the major factors in machine operation can be determined from a thorough understanding of the air flow in the machine, and in this article D. S. M. Phillips, Physicist, Department of Agriculture Animal Research Station, Ruakura, describes a meter for measuring air flow.

THE direct measurement of air flow provides much more useful information than the measurement of vacuum level alone. Much field investigation work in the last few years has been devoted to the mapping of air flow in typical machines in various states of repair and under all conditions. From these figures and other detailed studies have come accurate tables of data for use in the testing of machines and improved and simplified methods of measurement and testing. This work has now reached the stage where it can be applied in the field.



The multi-orifice air-flow meter in use.

Importance of "Reserve Air"

The control of vacuum in the machine is extremely important in obtaining efficient milking and depends almost entirely on the provision of a sufficient quantity of "reserve air" and an efficient relief valve to handle it. This reserve air is provided by the vacuum pump, which must run at a speed which allows it to pump more air than the machine normally uses, thus making a reserve available to cope with additional air inlets. The relief valve is very important, as it must regulate the admission of this reserve air in such a way that the machine vacuum remains constant.

The accurate measurement of reserve air is fundamental in obtaining efficient milking, and is possible only by the use of some device for measuring air flow.

Causes of Low Reserve Air

The measurement of reserve air alone is not sufficient; the cause of the deficiency must also be located so that appropriate adjustments can be made. In this respect the air-flow meter is of the utmost value, as it enables the serviceman to check rapidly the air-flow levels in all parts of the machine under working conditions.

Factors of importance include:—

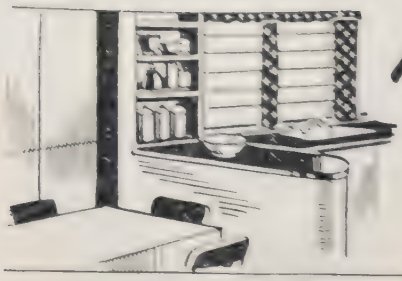
1. **Vacuum pump efficiency:** The efficiency of a vacuum pump can be determined accurately under working conditions only with an air-flow meter.
2. **Milking machine tests:** The leaks in the various parts of the machine are frequently very difficult to locate by normal means and here also an air-flow meter provides a rapid and accurate test.
3. **Milking machine air consumption:** The air-consumption figures for the various parts of the machine provide much essential information on operation and indicate immediately the presence of leaks, which cause low reserve.
4. **Machine design faults**, which cause loss of vacuum owing to the flow of air through pipes and various obstructions. This is a very important factor in determining vacuum pump efficiency and correct operation of releasers and pulsators.

None of these measurements, of fundamental importance to machine operation, can be made unless some form of air-flow measurement is possible.

Correct Air-flow Figures

Detailed air-flow tables are now available from research work carried out at Ruakura Animal Research Station in the last few years. Air-consumption figures for various types of machines under different conditions have been provided by measurements made on milking machines in the field.

The determination of the level of reserve air in relation to machine air consumption and machine construction was a somewhat more difficult problem and remained unsolved until recently. Its solution lay in a detailed investigation, made with a recording vacuum gauge, of a typical milking machine during milking. In this particular investigation the pump speed was adjusted so that any required reserve-air level could quickly be obtained by admitting air to the machine through an air-flow meter; at the same time recordings of vacuum were made at a number of places on the machine, including at the cups, while milking progressed. The results showed quite clearly that the importance of the reserve lay in the recovery time of the machine after an air admission, such as when cups were changed. Reserve-air and vacuum tank volumes had relatively little effect on the initial fall in vacuum to about 10in. of mercury, but they did have a very marked effect on the recovery of vacuum once the air admission was stopped. It was also found that if the recovery time was about 3 seconds, the fall in vacuum became barely noticeable at the cups owing to the cushioning effect of the milk in the dropper. This figure was used as a basis for the mathematical calculation of "correct" reserve-air figures for various sizes of milking plant, the air-consumption figures obtained from field tests being used. To be correct these figures should be calculated for any particular machine in question, but the calculation is far too long for this method to be useful, and tables for general types of machines can provide sufficiently accurate results. Such tables, for a common type of milking plant, are given on page 215. Some latitude in the figures is given, as it is not always possible to set pump speeds exactly, and precise figures are quite unnecessary, especially when a general table is used. (Accuracy in air-flow measurement is important, however, in



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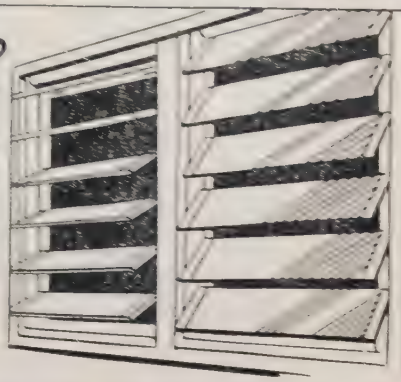

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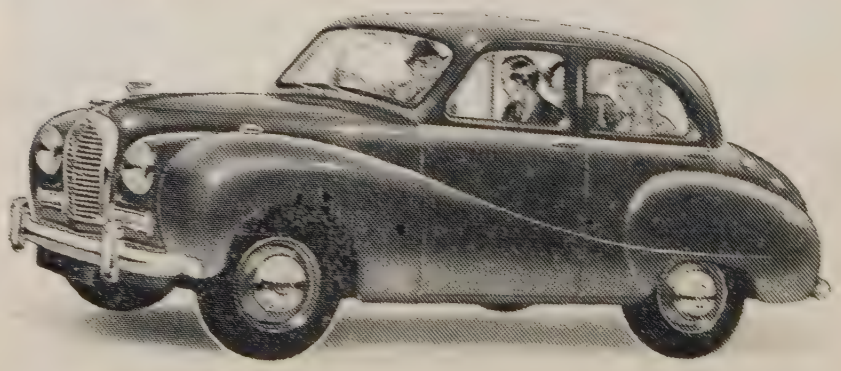

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determining leaks and vacuum pump efficiency.)

The tables give preliminary figures and are for standard types of machines with 4-gallon vacuum tanks, 1 32in. air admission, and soft inflation cups.

TABLE 1—NOT MILKING (Pulsators on, Relief Valve off)

(Measurements in cubic feet of air per minute where 1 cub. ft. = 6¼ gallons)

Size of plant	Reserve air	Pump capacity	Machine consumption
Single:			
[illegible]	[illegible]	[illegible]	[illegible]
3-cow	10-11	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	14-15	[illegible]	[illegible]
½-cow	15-16	[illegible]	[illegible]
7-cow	17-18	[illegible]	[illegible]
8-cow	18-19	[illegible]	[illegible]
9-cow	19-20	[illegible]	[illegible]
10-cow	20-22	[illegible]	[illegible]
Doubled up:			
2-cow	11-12	[illegible]	[illegible]
[illegible]	13-14	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TABLE 2—MILKING

(Measurements in cubic feet of air per minute where 1 cub. ft. = 6¼ gallons)

Size of plant	Machine consumption	Reserve air
Single:		
2-cow	6-8	7-9
3-cow	8-10	7-9
4-cow	10-12	8-10
5-cow	12-14	9-11
6-cow	14-16	9-11
7-cow	16-18	10-12
8-cow	19-21	10-12
9-cow	21-23	10-13
10-cow	23-25	11-13
Doubled up:		
2-cow	10-12	7-9
3-cow	15-17	8-10
4-cow	19-21	8-10
5-cow	23-25	8-11
6-cow	28-30	8-11
7-cow	32-34	9-12
8-cow	37-39	9-12

Vacuum Pump Capacities

The pumping capacities of a number of types of vacuum pumps are given in Table 3. These have been taken from the highest figures in field tests and represent the figure to be expected if a pump is in good order. These tables will no doubt be superseded when air-flow measurement is more general and further figures come to hand.

TABLE 3—PUMP TABLES

Speed	Standard Masport MacEwan	Masport Senior	Masport (Ridd) "Super"	MacEwan "Super"
150	11	16	—	22
200	14	19	21	29
230	16	19.5	24	33
250	18	20	26	36
270	19	22	28	39
280	20	23	29	40
290	21	24	30	42
300	22	25	31	43
320	25	26	33	46

Measurement of Air Flow

Neither the tables given nor an air-flow meter are of any value alone; reliable figures will be useful only if applied with the use of an accurate measuring device.

To this end a thorough study of air-flow measurement techniques has been carried on at Ruakura over the last year or two. In the course of this work many types of instruments have been developed and tried out. As the air-flow work progressed the requirements of an air-flow meter suitable for servicing could be stated fairly definitely as follows:—

1. **Range:** The meter should be capable of measuring pump capacities of up to 50 cub. ft. per minute. It should be capable of distinguishing between air flows differing by as little as ½ cub. ft. or less per minute, making it possible to measure the air consumption of a single bail pulsator.
2. **Accuracy:** Over-all accuracy should be about 3 to 4 per cent. to give a reliable check on vacuum pump performance.
3. **Simplicity:** The meter must be as simple as possible so that its use is easily understood and so that incorrect use by unskilled persons is not readily possible.
4. **Robustness:** It must be mechanically strong and capable of withstanding the type of handling to be expected from everyday use by machine fitters under all conditions.
5. **Calibration:** The meter must retain its calibration over long periods and under adverse conditions, as frequent checks on calibration will be impossible except by comparison with a similar instrument.
6. **Portability:** It must be readily portable and easily set up and attached to the milking machine, in spite of difficulties in finding a suitable point for connection. In addition, the meter should not be of such a type that the position of attachment will affect its accuracy.
7. **Non-continuous flow:** The meter must be capable of giving a reliable reading of mean air flow when a pulsating air flow is passing through it, as is generally the case in machine testing.
8. **Production:** If the meter is to be used in commercial testing and servicing, it must be produced in quantities and be reasonably low in cost. Therefore, it must be suitable for quantity production and must not involve too much individual work in calibration and adjustment.

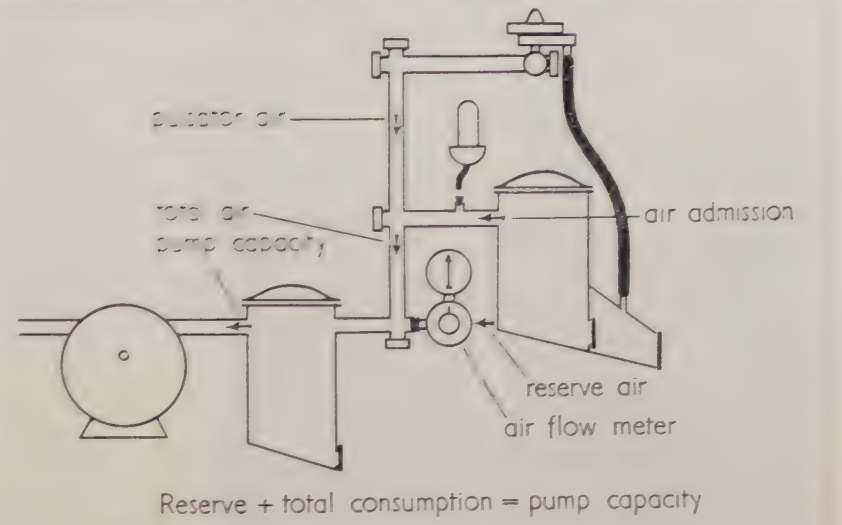


Diagram showing the method of air-flow measurement and the distribution of air flow in the machine.

The seal and stamp used by Ruakura Animal Research Station to seal tested meters.

Multi-orifice Type Meter

The multi-orifice type air-flow meter was originally developed at Ruakura to fill the requirements given. In principle it consists of a metal plate through which are drilled a number of small specially shaped orifices, arranged in a semi-circle so that they can be opened or closed one at a time by rotation of a close-fitting sliding cover. The hole diameters and the entrance shape of these orifices are adjusted by reaming so that each will admit exactly ½ cub. ft. of air per minute when the vacuum across them is 15in. of mercury. Measurement of pump capacity or reserve air is done by connecting the meter to the pump or machine respectively and opening the orifices until the vacuum level comes to 15in. of mercury; the number of orifices open then gives the air flow. These orifices can be made so that each will admit exactly 1 cub. ft. of air per minute and thus the number open gives the air flow in cubic feet per minute. The illustration on this page shows air-flow measurement, including measurement of the reserve air, and indicates the

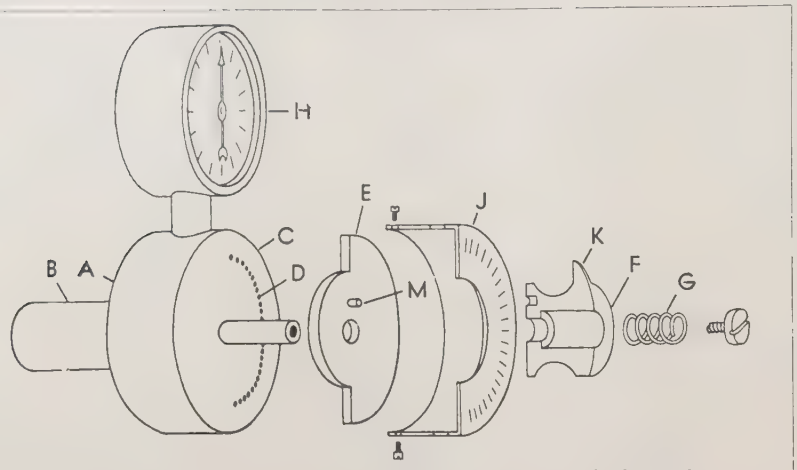


Diagram of the Ruakura-type multi-orifice air-flow meter described on this page.

manner in which the factors pump capacity, machine air consumption, and reserve air are related. The meter is seen in use in the illustration at the head of this article.

Some of these meters have been used in the early field trials conducted by two officers of the Dairy Division of the Department of Agriculture and in field work by Ruakura research workers, so that many will be familiar with their appearance and operation.

The meter was developed by the author more than 2 years ago and its possibilities were recognised. However, preliminary work suggested that it would be difficult to prevent such small orifices from wearing or becoming contaminated and that the fine work involved, with the need for special air-flow metering apparatus in making and testing the orifices, would make the manufacture of 50 orifices for each meter too expensive.

Therefore, another type of meter was developed as a possible commercial type, but it was found unsuitable for field work, though its manufacture would have been relatively simple. In the meantime, several firms had become interested in air-flow meters and several prototype models of various types were submitted for test. None of them measured up to requirements. However, further work at Ruakura showed that commercial manufacture of the Ruakura-type multi-orifice meter was possible at reasonable cost, provided the necessary precision measuring equipment was available and a method of ensuring protection of the small orifices was perfected. Such a meter is now in commercial production and is being used by Dairy Division officers.

The essentials and construction of the Ruakura-type multi-orifice meter are shown in the illustration on this page. The meter consists of a hollow body (A) with a tube (B) for connection to a machine. The front orifice plate (C) carries a series of small orifices (D) which can be opened or closed by rotation of the cover (E), turned by the knob (F) engaging pin (M). The sliding cover plate (E) is held firmly on the surface by the vacuum and also by the spring (G). The air-flow level (that is, the number of holes open) is indicated on the scale (J) by the pointer (K). The scale also acts as a protecting cover for the meter and has a number of holes round it to let in the air. The cover (E) can be made from a flexible plastic sheet or other suitable material which requires no lubrication and seats well on the front surface.

The accuracy of the meter and the manner in which the orifices retain their calibration are determined entirely by the precision and care taken in their manufacture and by the accuracy of the apparatus used for checking. Normal drilled holes are useless, as small irregularities could cause errors of up to 20 per cent. or more; therefore the design of an orifice which would permit accurate reproduction and calibration was the first essential to successful manufacture. With the use of these methods accuracies of better than 1 per cent. are quite possible at reasonable cost. Some appreciation of the importance of this factor can be gained from the fact that an error of 1/10,000in. in orifice diameter can alter the air-flow level by 1 per cent.

Inaccuracy in the vacuum gauge affects the air-flow reading to a small extent when "internal air flow" is measured, but it has no effect on "free-air" flow into the orifices as long as the true vacuum level is above 13in. of mercury. The important property of the small orifice is that free-air entry is limited by the velocity of air flow and remains constant as long as the vacuum is above 13in. of mercury. The error in internal flow is approximately 2½ per cent. for a gauge error ½in. of mercury. For this reason, where conventional types of vacuum gauges are used some method of checking the gauge accuracy periodically should be employed.

As the value of any air-flow meter lies in its accuracy, it is most important that farmers should have some guarantee that the instrument used in testing milking plants is accurate. This is even more important in the multi-orifice type meter, in which the accuracy depends on design and precision workmanship.

Accordingly, arrangements have been made for Ruakura Animal Research Station to test and seal all meters submitted by manufacturers. Meters once sealed could not be altered without the seal being broken. The seal and stamp used by Ruakura, ½in. in diameter and bearing the initials of the station, are shown in the illustration on page 215.

This seal and a certificate which accompanies any tested meter are a guarantee of accuracy, and readings taken with such a meter can be relied on. Farmers should always see that the instrument used in testing is sealed in this way.

Care Necessary in Carrying Firearms

USERS of firearms should always make sure that the weapons are held or carried with the muzzles inclined upward. In the illustration on the left above the man in front is holding his gun with the triggers downward. If the gun accidentally discharged the man behind could easily be injured, especially as neither man is aware of the danger. If the gun was held with the triggers upward as shown in the illustration on the right above, the danger would be eliminated.

Always make a habit of holding firearms with the muzzles pointed upward and be especially careful when shooting with a party.

—*G. G. KELLY*

Pumping Skimmed Milk to Piggeries

EASY and efficient transport of skimmed milk from the separator to the piggery has always been a problem for the dairy farmer. In this article I. H. Owtram, Extension Officer in Pig Husbandry, Department of Agriculture, Wellington, deals with skimmed milk pumps and their use.

THE feeding of dairy by-products in the form of skimmed milk and whey to pigs has been practised in New Zealand from the beginning of the dairy industry. Different methods have been used to get skimmed milk to pigs; one of the earliest and simplest was to allow the skimmed milk to fall from the separator into a trough, from which the pigs consumed it. However, owing to the bad effect that the proximity of the pigs tended to have on the quality of the cream produced, this method was frowned on and has in recent years been almost entirely superseded by better methods. A minimum distance of 50yds. between cowshed and piggery was fixed by the Dairy Industry Act in 1898.

Carrying the skimmed milk in kerosene tins proved very laborious and transport of cans and oil drums on a sledge pulled by a horse was a popular, though messy, method. In some cases a tramway was used along which was pushed a trolley holding a tank for the milk. Where the lie of the land permitted, an open chute down which the skimmed milk ran by gravity proved labour saving, but enabled birds and in some cases animals to sample the milk on its way to the piggery.

Finally the skimmed milk pump was adopted and is now almost universal. The skimmed milk falls directly from the separator into a funnel connected to the pump and is pumped straight to the piggery.

[*National Publicity Studios photo.*

Suitable Pumps

Skimmed milk as it leaves the cream separator contains a considerable quantity of air, owing to the way in which it is flung out of the separator bowl. The large amount of froth associated with skimmed milk is proof of this, as froth is caused by air escaping from the liquid. Because of the air it contains, skimmed milk is a spongy liquid, whereas water or oil in its normal state is not. Therefore a pump with a positive action—that is, a plunger type with valves—is required for delivering skimmed milk; neither a rotary nor gear type is satisfactory. Another reason why rotary or gear-type pumps are unsatisfactory for skimmed milk is that even with the largest separator used on farms and the smallest skimmed milk pump of these types, the pump is never working at its full capacity. Even with a 200-gallon separator (one that will handle 200 gallons of milk per hour) the smallest type of pump can deal with nearly twice as much as the separator in the same time.

Two types of reciprocating pumps are in general use, the vertical and the horizontal or bulldozer types. Both are quite satisfactory and the layout of the separator room is the deciding factor as to which is used. It is usual to drive the pump by an independent $\frac{1}{4}$ or $\frac{1}{3}$ h.p. electric motor. This is generally mounted on the pump itself, the drive being by a V belt.

Mounting of Pumps

The horizontal or bulldozer type of pump is usually mounted on an extension of the separator base plate and is frequently driven by the same electric motor that drives the separator. Where the latest design of separator equipped with a built-in motor is used this is not possible and an independent motor is required. When the pump is mounted on the separator base plate a very short intake pipe is required between the funnel into which the skimmed milk falls from the separator and the pump.

The vertical type of pump is generally mounted against the wall of the separator room. When this type of pump is used it should be equipped with what is known as a glandless head, because if the stuffing-box type of gland is used, it will be extremely difficult to prevent a slight leak at this point, which makes an unpleasant mess. With a vertical pump mounted on the wall a considerably longer intake pipe is required and this generally has to run along the floor, which is a slight disadvantage. The pump should be placed in such a position that this pipe is not in the way in the separator room and causes the least possible inconvenience when washing down.

In sheds where shafting and belts are used, as in districts where mains electricity is not available, both types of pump can be driven easily by this means.

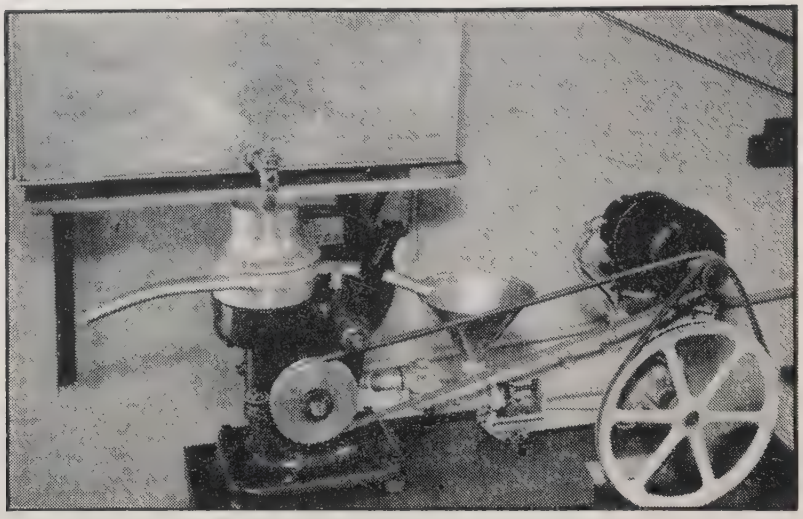
Delivery Pipe

The delivery pipe from the pump to the piggery must be at least 50yds. long, as this is the minimum distance that the piggery may be from the cowshed, and in many cases it is 5 to 10 chains or more. The pipe should be buried underground deep enough to be safe from damage from traffic, implements, and stock. This also protects the pipe from the heat of the sun and from frost, both of which can affect the efficiency of an installation. The size of pipe in most general use is $\frac{3}{4}$in., but $\frac{1}{2}$in. plastic or copper pipe may be as good, and perhaps even better, as the greater force with which the milk passes through the pipe tends to have a scouring action and to prevent the formation of curd on the inside of the pipe.

Galvanised or black pipe with screwed joints has always been used in the past, but recently some installations of both copper and plastic pipe have been made. These have the advantages of being able to be laid in one piece without joints from cowshed to piggery and can be buried by a mole plough. This effects a large saving of labour in installing and eliminates trouble at joints, the points at which leaks always occur first in an ordinary pipeline. The smooth finish of the inside of both copper and plastic pipes makes them easier to keep clean, the plastic pipe being particularly good, as it is unaffected by the acids in the milk or the soil.

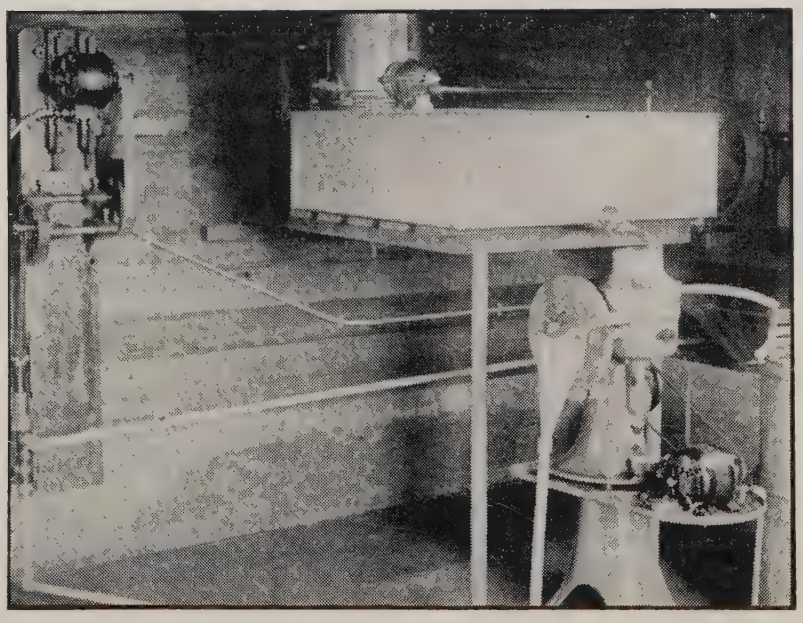
Risk of Zinc Poisoning

When new galvanised piping is used there is an element of risk of zinc poisoning, owing to the lactic acid in the milk dissolving some of the zinc lining of the pipe. However, lactic acid forms in the milk as it turns sour; if care



[*Green and Hahn Photography Ltd. photo.*

Above—Horizontal or bulldozer type of pump mounted on an extension of the separator base. Below—Vertical type of pump with glandless head mounted on the wall of the separator room.



is taken to see that milk never lies in the pipeline, but that the pipeline is always kept full of clean water, the risk of zinc poisoning is very small. A sound practice is to flush a new galvanised pipeline thoroughly with water before it is used at all and to see that this water does not go into the milk container at the piggery. Another good idea is to buy sufficient new pipe for the job and then to use this to replace a similar length of water pipe that has been in use for some time and to use the latter for the skimmed milk. The symptoms of zinc poisoning are progressive lameness and general unthriftiness. Any farmer noticing these symptoms after a galvanised pipeline has been installed should immediately get in touch with the nearest veterinarian.

Skimmed milk pumps and pipelines must be kept clean, otherwise sick pigs will be the result. The most important point in keeping the line clean is that it should be kept full of clean water when not being used for skimmed milk. The use of molasses to help keep the line clean can be recommended. The following method has been found satisfactory:—

A supply of an 8 : 1 solution of molasses (8 parts of water to 1 part of molasses) is kept at the cowshed (hot water dissolves the molasses quicker). Immediately the separator has been flushed about ½ gallon of molasses solution is poured into the skimmed milk funnel, and as soon as the liquid has disappeared water is pumped through until the pipeline is full of water. The easiest way to do this is to have a tap over the funnel or to use the hose from the cream cooler. The water should be turned on sufficiently to ensure that the pump is working at capacity. Once the time necessary to fill the pipe has been found the water is simply left running for this period and then pumping is stopped. A non-return valve placed in the delivery pipe as close to the pump as possible will prevent any leakage of the water back past the pump where a considerable lift to the piggery site is involved. This method, used always, will keep both pump and pipeline clean.

Caustic soda must never be used to clean a skimmed milk line. It causes very serious trouble and even deaths of pigs, which, if killed in this way, are valueless.

If drastic cleaning of a pipeline that has been allowed to become foul has to be carried out, great care must be taken to see that nothing gets into the milk container while cleaning is being done and that very thorough flushing of the line is carried out afterward. The water used in flushing must not be allowed to run into the milk containers.

A properly installed skimmed milk pump and pipeline treated as indicated will give years of trouble-free service with the minimum of attention and is a labour-saving device that is a necessity on a dairy farm.

Radio Broadcasts

RADIO broadcasts to farmers will be given as follows during October:—

1YA Auckland, 7.15 p.m.

1 October—"Establishment and Maintenance of Lawns", by W. D. Alchin, Horticultural Instructor, Department of Agriculture, Auckland.

8 October—"Silage Making and Machinery", by J. E. Bell, Fields Superintendent, and D. F. Scott, Farm Machinery Instructor, both of the Department of Agriculture, Auckland.

15 October—Talk by a Veterinarian, Department of Agriculture.

22 October—"Gorse Control", by C. A. Blick, Fields Instructor, Department of Agriculture, Warkworth.

29 October—Y.F.C. session, by the Waipa District Committee of the Federation of Young Farmers' Clubs.

1XH Hamilton, 12.33 p.m.

2 October—"Foot-rot in Sheep", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

9 October—"Management of Lucerne", by J. R. Murray, Instructor in Agriculture, Department of Agriculture, Hamilton.

16 October—"Hygiene in the Milking Shed", by A. Gabolinscy, Special Inspector, Department of Agriculture, Hamilton.

23 October—"Marketing of Wool", by H. A. Wagstaff, Meat and Wool Section, Federated Farmers, Hamilton.

30 October—"Phosphate Fixation", by E. B. Davies, Department of Agriculture Soil Research Station, Rukuhia.

1YZ Rotorua, 7.15 p.m.

2 October—"Pollination and the Honey Bee", by R. Goddard, Apiary Instructor, Department of Agriculture, Tauranga.

16 October—"Annual Cropping in the Rotorua District", by C. R. Taylor, Fields Instructor, Department of Agriculture, Rotorua.

30 October—"Foot-rot in Sheep", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

3YA Christchurch

9 October (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

Other Broadcasts

1YA Auckland, Tuesdays at 12.35 p.m. and Wednesdays at 7.15 p.m.; 1YD Auckland, Thursdays at 7.30 p.m.; 1XN Whangarei, Mondays and Wednesdays at 8.10 p.m.; 2XA Wanganui, Thursdays at 8 p.m.; 2XG Gisborne, Tuesdays at 8 p.m.; 3XC Timaru, Wednesdays at 8.5 p.m.

Spring Work in the Home Orchard

By H. P. THOMAS, Horticultural Instructor, Department of Agriculture, Wanganui

SPRING is a busy period in the home orchard. The most important work is that of keeping trees and the developing crops free of diseases and pests, yet it is frequently the most neglected, for few like spraying. Manuring, if not already done, should be carried out without delay so that the crop may secure some benefit from the fertiliser applied. Mid-September to early October is the period for grafting, and where this work is contemplated the necessary material should be assembled in readiness. Thinning of the fruit crop is an important job that must not be overlooked where good fruit setting has occurred. Cultivation should be done to keep the soil in good tilth and to control weeds; this is especially important around newly planted trees and will assist them to become established more rapidly. Grapevines, outdoor and under glass, should receive constant attention.

MANY home gardeners have the impression that the fruit crop need not be sprayed until the fruit has begun to grow, and others consider that after applying one or two sprays they have done all that is necessary; disease and pest control unfortunately is not as easy as that. Complaints are often heard that spraying is ineffectual or that a certain spray is useless, whereas the real reason for failure is that the user has insufficient understanding of the principles of disease control.

Sprays should be used for the prevention of disease infection and pest attack, not as a cure.

The tree and crop should be thoroughly covered by a protective film of spray during the period before diseases and pests are prevalent.

Sprays do not give a lasting coverage. Their period of effectiveness is relatively short and may be shortened still more by continual rains. Further, the rapid growth in spring and early summer soon develops new leaves and increases the size of fruit, so that there are fresh surfaces which are unprotected. Spraying therefore must be continual throughout the season, beginning with the base sprays at bud movement and continuing more or less at 2- to 3-weekly intervals until shortly before harvesting.

The three main factors for successful spraying are effective spray equipment, correct spray mixtures, and complete coverage during periods when disease and pest attacks may be expected. Spray recommendations are given in the table on page 221.

Heading photograph by Ellis Dudgeon.

Manuring

Plant foods are removed from the soil each year by fruit trees and bushes, and unless they are replaced by organic materials and fertilisers, the trees eventually must deteriorate in both growth and bearing capacity.

The quantities and kinds of fertiliser to use will differ according to the fertility of different soils. Generally it is wise to use a complete fertiliser containing the three elements which are usually shortest; nitrogen, phosphorus, and potash. As a guide the following mixtures (parts by weight) are suggested:—

For apples, pears, and apricots: 2 parts of blood and bone, 2 parts of superphosphate, 1 part of sulphate of ammonia, and 1 part of sulphate or muriate of potash.

For peaches, plums, citrus, and subtropical fruits: 2 parts of blood and bone, 1½ parts of superphosphate, 1½ parts of sulphate of ammonia, and 1 part of sulphate or muriate of potash.

The rate of application will vary from 1lb. up to 15lb. per tree, according to size, age, and cropping capacity. Trees that have lost their vigour and stagnated should receive an increased amount of a nitrogenous fertiliser and potash should be cut down or eliminated for a year or two. Nitrogenous fertilisers should not be applied to trees that are very vigorous and have not settled down to fruiting.

As fruit trees take up much of their plant food requirements early in the season, manuring should be done early. If fertilisers have not yet been applied, the work should be done without delay and the manure should be lightly hoed in round the trees.

Grafting

Home gardeners who are contemplating grafting should have the scions heeled in in readiness for this work. Grafting may be carried out from about mid-September, when growth has begun and the sap is flowing freely. If grafting is done too early, the scions may fail to take, and if the work is delayed until the trees have reached the flowering stage, the scions may be "drowned" by the rush of sap and fail to make satisfactory growth.

The simplest way of grafting fairly small trees is to head them well back.

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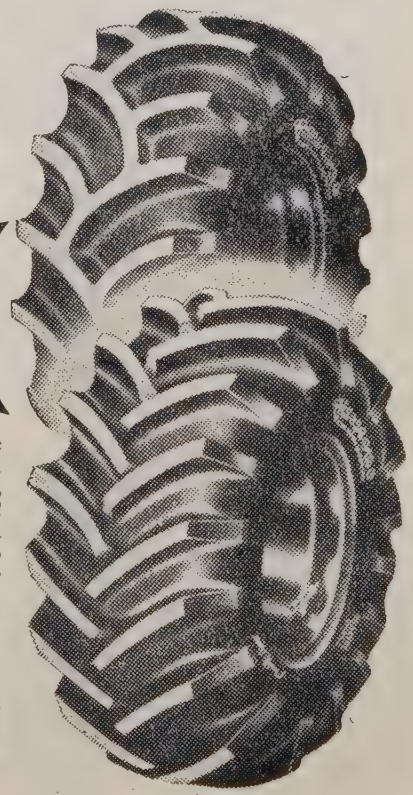

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reworking pip fruit trees with a more favoured variety. Gardeners will find pleasure and profit in reworking an unsuitable variety or a seedling.

Stone fruits and citrus are generally reworked by budding, as grafting is more difficult and less successful. Whatever the method of grafting followed, the essential points are to secure a close contact between the cambiums of scion and stock and to seal the join against air and moisture. A good grafting wax, grafting tape, or green crude petrolatum will give satisfactory seals provided care is taken to cover the cut portions of scion and stock completely.

Grafts should be watched, and where ties (such as raffia or grafting tape) have been used they should be eased as soon as the swelling of the scion indicates that it has taken; this can be done by running a knife through them on the side opposite to the graft union.

Gardeners desiring instructions on budding and grafting should consult the Department of Agriculture Bulletin No. 285, "Grafting of Fruit Trees". This and other bulletins giving more detailed information about home orchard work are available free from offices of the Department.

Thinning

When crops are light thinning is seldom necessary, and when crops are heavy few gardeners can bring themselves to the point of carrying out this necessary task. To many it may seem a shame to pull fruit off, but unless the overloaded tree receives some relief the fruit will tend to be small and not so juicy and full flavoured. Crowded fruits make disease control more difficult and greatly favour the spread of brown rot.

Heavy crops of apples and pears should be thinned to leave not more than three fruits in a cluster, and many clusters should be thinned to singles or twos. Stone fruits should be thinned to twos or singles, mainly singles. Sufficient room should be left between clusters so that they do not touch. The trouble taken to thin adequately will be repaid with large, good-quality fruit which can be harvested with pride.

Cultivation

Deep cultivation should have been done in the winter. Once the trees have begun to grow cultivation should not be to a depth that will disturb the roots and upset the supply of food to the trees.

Light cultivation around the trees should be begun as soon as weather conditions are favourable and continued throughout the season. After wet weather, cultivation can do much to get rid of excess moisture, and in summer it can assist in preventing loss of moisture.

Weed control is important as a means of conserving moisture in dry months and is also of assistance in disease control by eliminating some of the hosts of diseases and pests.

Grapevines

The growth of vines under glass should receive careful attention. Vines should be lowered, if this has not been done already, and left until growth starts; this assists in obtaining an even "break" of buds along the whole length of the vine.

To assist vines to break into growth increased temperature and humidity are desirable in glasshouses at this time of year.

During October new vine growths must be attended to and those showing promise of carrying good bunches should be retained and the excess shoots removed. The shoots to be retained should eventually be pinched off at the second leaf past the young bunch of fruit. The young shoots should be trained to fill the spaces between the rods and should be tied carefully to the supporting wires.

Spray Applications for Home Orchards

Time of application	Treatment	Pest or disease
	Apples and Pears	
Pre-blossom	½ pint of lime sulphur to 4 gallons of water	Black spot, powdery mildew, and other fungous diseases
Petal fall	¼ pint of lime sulphur, 1½oz. of lead arsenate powder, and 3oz. of hydrated lime to 4 gallons of water	This is the first spray for codling moth; also for fungous diseases
Two weeks after petal fall and every 18 to 21 days until end of February	As for petal-fall spray	Codling moth, bronze beetle, leaf-roller caterpillar, and fungous diseases
When pests appear about December-January	½ pint of summer oil to 4 gallons of water	Red mite, scale insects woolly aphis
	Stone Fruit (except Apricots)	
Petal fall Repeat petal-fall spray once a month to within a fortnight of harvesting	¼ pint of lime sulphur and 1½oz. of colloidal sulphur to 4 gallons of water	Brown rot, shot hole, leaf rust
	Citrus	
November	Bordeaux mixture (4oz. of bluestone and 5oz. of hydrated lime to 4 gallons of water)	Verrucosis, grey scale, wither tip
Early January (not lemons)	1oz. of lead arsenate to 4 gallons of water	Leaf-roller caterpillar
Mid-February	1 pint of summer oil and 4/5 fl. oz. (5 teaspoons) of nicotine sulphate to 4 gallons of water	Scale insects, black aphis

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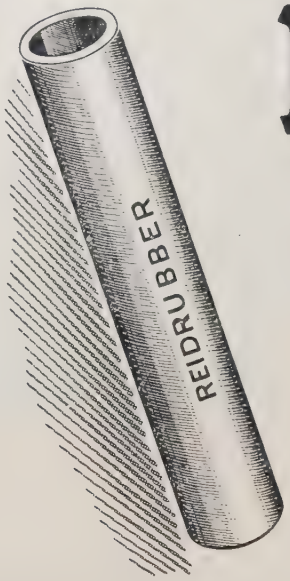

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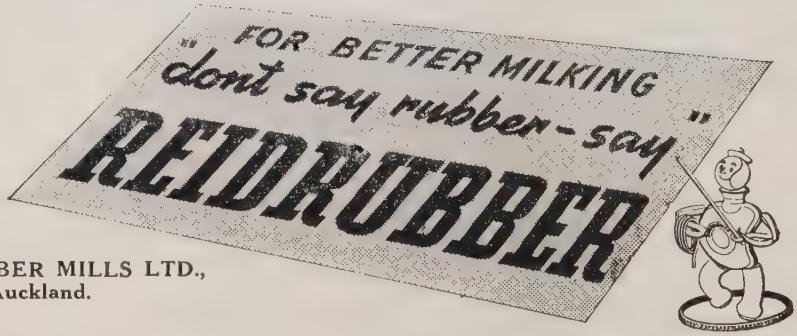

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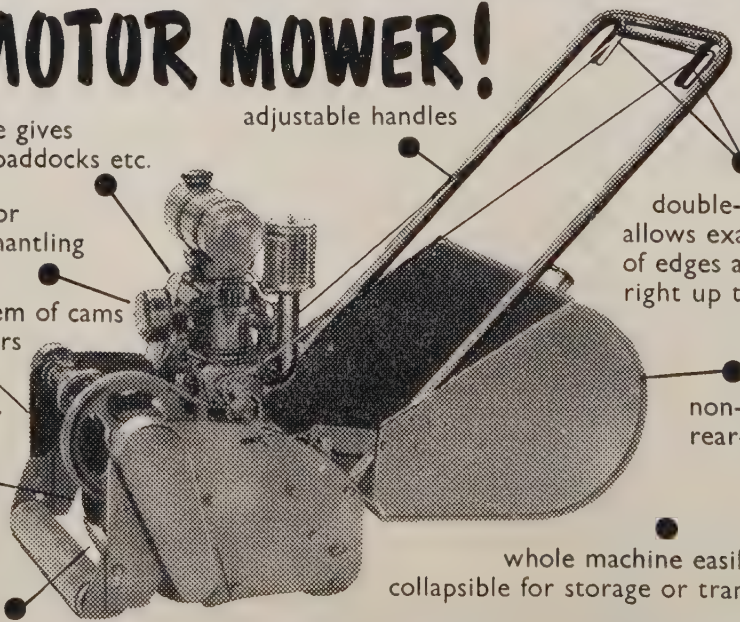

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Common Troubles in Household Poultry Flocks

CERTAIN common problems cause concern and annoyance from time to time to the household poultry keeper, judging from the numerous inquiries received by the Department of Agriculture. Among these are broody hens, eggs containing blood spots, birds which will pull feathers out of one another, and those persisting in egg eating. These are discussed in this article by the Animal Industry Division.

BROODINESS in poultry is a natural characteristic which can be inherited from one generation to the next. It is common in heavy breeds and heavy breed crosses, but is comparatively rare in light breeds. Broody hens were once essential for carrying out natural hatching and rearing. Today, however, poultry breeders use incubators and endeavour to eliminate broodiness from their heavy breed birds by careful selection of non-broody hens for the breeding pens.

Thus some strains of Australorps or Rhode Island Reds are less broody than others, according to the amount of work done by the breeders of these strains when selecting their stock. Again, some birds when they go broody can easily be brought back into production; others with the broody factor more pronounced in their make-up are most persistent and are difficult to get back into production quickly.

Many household poultry keepers avoid running heavy breeds for the sole reason that these birds go broody and require special treatment to break this broodiness. In many cases broodiness causes more trouble and loss of production than is necessary, largely because the owners of birds have little or no knowledge of how to manage broody hens. It is said that some resort to ducking broody hens in a bucket of water, of keeping food away from them, and even of putting them into a sack hung on a clothes line.

A broody hen's first action is to seek a comfortable and warm place to sit on her eggs; food is of secondary consideration to her. In a short time her ovary ceases to be active and egg production stops. Therefore to break broodiness rapidly the hen must be denied conditions which are conducive to broodiness.

As soon as broodiness is detected the bird should be placed in a properly constructed broody coop. The latter is designed to afford the maximum of air (not draughts) around the bird and the minimum of comfort. The bird must be fed a full ration so that stimulation of the ovary continues and to stop the bird from going out of production. Restricted feeding is often practised with broody hens, but is wrong and can cause the birds to go out of production for an appreciable period. The essentials are to catch the bird early as soon as broodiness appears and deny her comfort and warmth, but give food and water as though she were in full production.

Details of construction of a simple broody coop are shown in the diagram below. The coop may be placed inside the laying house or, if preferred, outside in a reasonably sheltered place. There is some advantage in broody hens being able to see the other birds feeding and at liberty, particularly if the broody birds are not fed at the same time as the rest of the flock. The broody birds become restless and want to join the rest, which is all to the good.

Signs of broodiness are, first, sitting for long periods in the nest box, ruffling up the feathers, a marked reluctance to leave the nest box when disturbed, and finally, the making of characteristic clucky noises.

Normal practice is to place the broody hen (or pullet) in the broody coop for 3 to 4 days and then to return her to the laying pen. This is sufficient to break the light broodiness in a hen caught in the early stages, and egg production is not necessarily interrupted. However, if upon being returned to the laying pen the hen again returns to sit on the nest at night, a further 3 to 4 days in the broody coop is necessary. Hens should receive normal feeds of laying mash and grain and clean water at all times during the period in the coop.

Broodiness causes extra work and birds subject to it require closer observation, but it is well to remember that though heavy breeds are prone to broodiness, they are also generally excellent winter egg producers, being affected less by cold, inclement weather than light breed birds. Broodiness is more prevalent in warm weather, particularly in spring and early summer, and also varies in extent from season to season.

Reminders for October

As warmer weather may be expected, watch for lice on birds and red mite under perches or in cracks of the woodwork of the house.

Broody birds should be placed in the broody coop as soon as observed.

Preserve eggs during this flush season for use in winter.

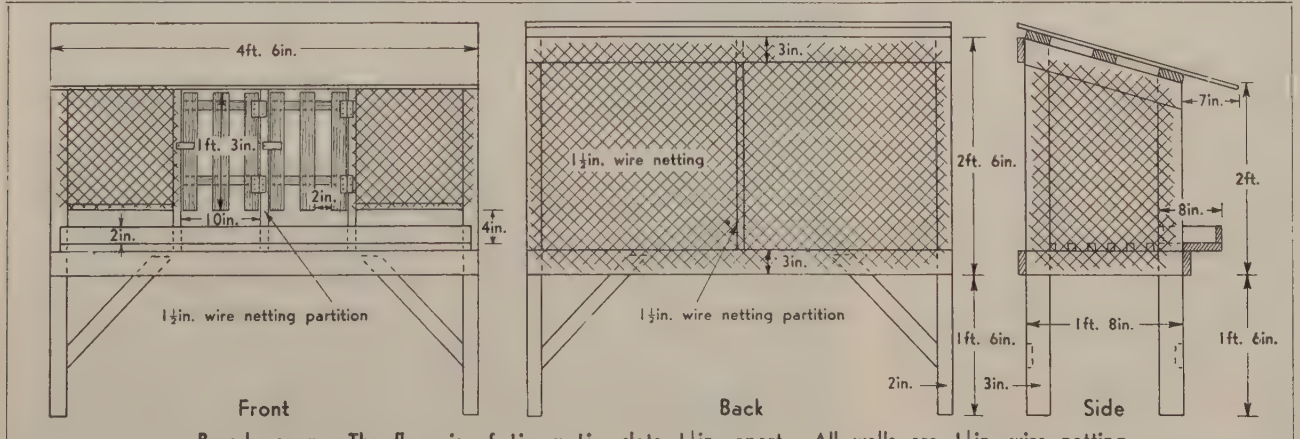
It is late for ordering of pullets for next laying season. Orders should be placed without further delay.

If the layer of litter on the floor has become low after winter, top it up with fresh straw.

Abnormal Eggs

To understand why abnormal eggs, such as double-yolked eggs, shell-less eggs, and eggs containing blood spots, are laid it is necessary to have some knowledge of the organs in a hen which produce eggs. Briefly the "egg machinery" consists of two separate organs: The ovary, where the yolks only are produced, and the oviduct where the white, shell membrane, and shell are produced and placed around the yolk. An active ovary appears as a bunch of yolks varying in size from a full-size yolk to white spots the size of a pinhead.

When a yolk has reached full size the fine membrane containing it splits and releases the yolk, which falls into the mouth of the oviduct. The latter when active is an elongated organ the lining of which is covered in secretory glands. The yolk soon after entering the mouth of the oviduct is surrounded gradually by white (albumen) secreted by glands at this end of the oviduct. Yolk and white then pass on down the



Broody coop. The floor is of 1in. x 1in. slats 1½in. apart. All walls are 1½in. wire netting.

oviduct until they reach the area where the lining secretes the shell membrane (the white skin under the shell). Again the egg moves on and the glands secrete the lime salts which harden into the shell. Finally in certain cases (brown eggs, for example) comes the pigment which colours the outside of the shell. Normally the process described takes approximately 24 hours.

Double-yolked Eggs

If instead of a single fully formed yolk falling into the oviduct two enter the oviduct within a few hours of each other, the natural processes surround both yolks with white, shell membrane, and shell and the result is one egg larger than normal containing two yolks.

When yolk development is somewhat over stimulated—as may happen when pullets first come into lay or if birds are receiving a protein-rich or stimulating diet—double yolks occur quite frequently. Double-yolked eggs are common among pullets first coming into lay and need not cause alarm, as the birds gradually revert to laying normal, single-yolked eggs. Occasional double-yolked eggs may be laid at any time by a pullet or hen, but, again, need cause no concern. Sometimes a bird lays a very large egg and may injure itself by protruding the end of the oviduct (prolapsis). This is a matter of chance and the household poultry keeper can do nothing to prevent this. Where pullets which have been in lay for some time appear to be laying an abnormal number of double-yolked eggs it may be desirable to cut down the meat meal in the mash for a short time or to bulk the meal by including finely chopped green food in the daily mash feed.

Blood Spots and Blood in Eggs

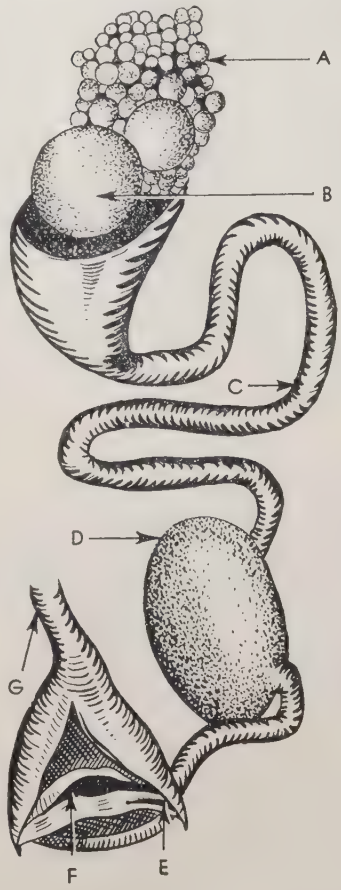
The membrane which holds the yolk in the ovary before releasing it into the mouth of the oviduct contains small blood vessels. If one of these blood vessels is ruptured when the membrane splits to release the egg, a small drop of blood may pass down with the yolk into the oviduct. The blood congeals in the ordinary way and later the egg when fully formed is found to contain a blood spot. If the blood spot is on the yolk, the cause is as stated; if it is in the white, the cause is a ruptured blood vessel in the oviduct. Blood in quantity in an egg is caused by the hemorrhage of a larger blood vessel.

Several reasons have been put forward for the occurrence of blood spots, including over-stimulation of the bird by diet and rupturing of blood vessels through birds jumping down from high perches or nest boxes, but none has been confirmed by scientific research. That a tendency to produce blood spots in eggs is an inherited factor has been demonstrated.

Poultry keepers cannot cure this trouble. If a bird which consistently lays eggs containing blood spots or blood can be traced, she should be culled. Blood spots are not connected with disease and the affected eggs are not harmful to humans.

Soft Shells and Shell-less Eggs

The immediate cause of soft-shelled eggs or eggs without a shell is failure of the glands in the oviduct to secrete the necessary lime or that, for some reason, the egg passes through this area of the oviduct too quickly.



Egg-producing organs of a fowl. A—Ovary and collection of yolks. B—Yolk about to drop into opening to oviduct. C—Oviduct, where white and shell are placed around the yolk. D—Egg passing through oviduct and receiving a shell covering. E—Opening of oviduct, through which the egg is laid. F—Vent. G—Intestine.

If this is due to some weakness in an individual bird, nothing can be done, but if several birds are laying thin-shelled, soft-shelled, or shell-less eggs, the trouble is likely to be associated with feeding. Laying birds should have access at all times to a trough of grit (oyster shell, pipi shell, or limestone). If, despite an adequate supply of lime fed in this manner, shell troubles are still experienced, it is recommended that birds be given 3 tablespoons of a fish oil to 10lb. of mash, the oil being rubbed in carefully to give even distribution. The oil will supply the birds with vitamin D, which assists them to make use of lime for shell formation. This applies particularly where birds are confined to a laying house. Oyster shell in broken form or as dust, in addition to the free supply, may be mixed with the mash until egg shells become normal.

Shell condition deteriorates after birds have had a long period of laying. Consequently shells are thinner and more brittle during summer.

Frequently pullets coming into lay will drop shell-less eggs under the perches at night. Concern need not be felt about this, as these shell-less eggs usually cease after the birds have been in production for a week or two.

Thin- and brittle-shelled eggs should not be used for preserving.

Egg Eating

It is typical of all laying birds that they will readily eat a broken egg. Sometimes this characteristic becomes a vice and certain birds will deliberately peck at eggs to break and eat them. The vice, which can become serious and lead to a substantial loss in eggs, is difficult to stop. Steps should be taken, by good management, to prevent birds from starting egg eating.

Attention should be paid particularly to nest boxes to ensure that they contain ample litter, especially if the bottom of the nest box is wood and not small-mesh netting. The latter is recommended. If eggs are broken in nest boxes, egg eating is encouraged. Eggs on the floor should be removed, and in the flush season eggs should be collected at least twice daily. Any broken eggs should be removed from the house promptly. Proper feeding, to prevent soft-shelled eggs, should be followed, since poor-shelled eggs offer a better opportunity for egg eating. Where egg eating has become established the following remedies can be tried:—

Collect eggs frequently.

Empty an egg of its normal contents through a hole and fill the shell with a mixture of flour, mustard, and a little kerosene. Leave these decoy eggs about for the egg-eating birds to attack.

If the offending birds can be identified, pare the points of their beaks down nearly to the quick with a sharp knife. This makes the beak tender and pecking of eggs unattractive. It does not stop birds eating either grain or mash.

Egg eating is not caused by some food deficiency.

Feather Eating

Quite often birds are observed to be losing feathers around the vent and from the hindquarters or abdomen. Such feathers have been pecked off and eaten by other birds. In all other respects the bird remains healthy, eats normally, and is in production. The feather-eating vice usually results from idleness, overcrowding, and poor conditions. Once started it is almost impossible to stop. Fortunately it need not lead to a loss in eggs and merely results in unsightly birds.

When it first starts steps should be taken to keep the birds occupied as far as possible with green food hung up in the house or by letting them outside to get them spread out. Fresh litter added to the house and feeding grain in the litter during the day assist in drawing the birds' attention away from one another. Contrary to what is often stated feather plucking and eating is not necessarily an indication that there is some deficiency in the diet. Even with the best feeding the vice can and often does develop, and once it starts little can be done. Fortunately pullets will regain their full feathering after the normal annual moult and feather plucking will not necessarily occur in the second year.

Location of Apiaries in Relation to Honey Crop Returns

MANY tons of honey are lost every year from causes other than inclement weather and bee diseases. Though the factors causing loss are often within the control of beekeepers, many have no idea that honey is being lost, so that very little is done about it. In this article L. A. Griffin, Apiary Instructor, Department of Agriculture, Hastings, points out how important it is to be careful in the choice of an apiary site to ensure maximum honey production and the well-being and efficiency of the bees.

IDEAL apiary sites are not easy to find, but the effort made to be sure that the best site available is chosen is well worth while. The placing of bees on any convenient spot and hoping for the best is a policy unlikely to be successful. In the selection of a site the difference a few yards will make to the well-being of the bees and the returns in honey is surprising. However, some locations are definitely bad for bees at any time of the year.

There are many points to consider when placing bees out, the first of which is shelter from prevailing winds. Hedges or native bush are generally satisfactory, but trees planted as windbreaks are not so suitable unless the branches come down close to the ground. Many apiaries are located under the overhanging branches of trees. Such a site is bad at any time, as it is always cold and draughty and generally damp for a great part of the year. Even on mild, almost windless days there is a cool draught. This causes many more bees to stay in the hives to keep up the temperature required for brood raising, etc., than would be the case if the hives were standing out in sunshine.

In winter although the hives are sheltered from rain, water percolates down through the foliage and branches of the trees and falls in large drops on the hives, disturbing the bees more than rain and the hives get just as wet. As the heat of the sun has little chance of penetrating under the trees, the hives are not able to dry out as they would do if out in the open. Damp, cold conditions usually prevail within the hives also, which cause a greater consumption of stores, with a possible chance of dysentery, and dwindling in the spring. The colonies never open up as strong and vigorous as colonies set out in an open, well-sheltered apiary.

Above—Good, airy, sheltered apiary location. Below—Draughty location on exposed hillside.

Colonies in these cold windy locations are more difficult to handle, and the bees are more inclined to sting. As so many more bees are forced to stay within the hives at all times to keep up the temperature, the operator naturally has more bees to cope with. Under better conditions most of these bees would be out foraging. The result is a great loss in the foraging capacity of the hives, and consequently a loss in honey crop returns. The point here is that a distance of 20yds. or so away from the windbreak of trees, out in the open, would probably be a good site for the apiary. All the shelter required is provided, but with the beneficial effects of sunshine and freedom from damp and cold draughts.

In warm, sheltered apiaries it is normal during a good honey flow to find the hives almost denuded of bees early in the day. All the bees, except the younger ones required for general

Recently vacated apiary site, which was too cold and draughty at ground level.

hive duties, are out foraging. These colonies must and do give better returns in honey than colonies placed in cold, windy locations.

Placing apiaries out in the open can also lead to losses which could be avoided. In very exposed positions with no shelter the bees are almost blown away as soon as they come out of the hives, if conditions are at all windy. This causes heavy wear and tear on the bees, greater consumption of food to supply energy for flight, and a greater loss in flying bees. Though bees should not be coddled, the beekeeper should see that they are not handicapped to this extent if maximum returns are to be expected from them.

In one case an apiary of 30 colonies was blown away during a gale, hives, bees, and combs being distributed over a radius of ½ mile from the site. Not one colony was salvaged. The bees had been on the site for 3 years and had never given payable returns. Cold and windy at all times, the site should never have been selected.

Locations on hillsides, unless good shelter is available or the bees are on the sheltered side of the hill, are nearly always subject to wind. If the main foraging area is on the lower ground, the bees are forced to fly uphill with their heavy loads of nectar. A minor point, but where large numbers of bees are forced to fly under these conditions, the loss of flying bees and honey mounts up.

One of the reasons, and perhaps the only one, for poor returns from hives may be a windy site. Moving the colonies a short distance away to a more sheltered spot, though not as convenient to get to with a truck, would probably solve the problem. It is necessary to be able to get a truck on to the site, but unless that site gives payable returns in honey, the beekeeper would be better off without it.

Water Supply

A handy water supply for the bees is also essential for maximum production; the closer the better. If the bees are forced to fly long distances to get water, the loss resulting from the hundreds of thousands of flights is considerable.

In very hot weather, say during a break in the honey flow, bees require large quantities of water, not only for brood raising, but to keep up the humidity within the hives to prevent the brood food in the cells from drying up. The amount of water required by a colony under these conditions is surprising.

In Australia, where large apiaries are the rule, an apiary of 240 colonies which was moved on to a gum flow had to have water carted to the drinking troughs in the apiary, the bees being too far away from the nearest source of supply. Though the amount of water used by the bees varied with the amount of nectar coming in, it averaged about 10 60lb. tins of water a day for the time the bees were on the gum flow. Water would be lost by evaporation and other causes, but in the main the bees had most of it. The toll of bee life it would take if the bees were forced to fly, say, half or three-quarters of a mile to reach the water supply would be hard to estimate.

The beekeeper has no yard-stick to measure his losses by, as all colonies in an apiary are usually affected more or less to the same extent. Therefore he has no indication that he is losing honey and that perhaps the colonies could have averaged another two or three combs per hive—the difference between poor and payable returns.

Show Dates

THE following are dates and venues of A. and P. shows up to early December:

October

*17 and 18 October—Poverty Bay A. and P. at Gisborne.

18 October—Ellesmere A. and P. at Leeston.

***22 and 23 October—Hawkes Bay A. and P. (Royal Show) at Hastings.**

24 and 25 October—Marlborough A. and P. at Blenheim.

25 October—Northern A. and P. at Rangiora.

30 and 31 October and 1 November—Waikato A. and P. at Hamilton.

31 October and 1 November—Wairarapa and East Coast A. and P. at Carterton.

November

1 November—Timaru A. and P. at Timaru.

*1 November—Amberley A. and P. (50th Jubilee) at Amberley.

*6 November—Ashburton A. and P. at Ashburton.

7 and 8 November—Manawatu and West Coast A. and P. at Palmerston North.

8 November—Tokoroa A. and P. at Tokoroa.

12 November—Thames Valley A. P. and H. at Te Aroha.

*12, 13, and 14 November—Canterbury A. and P. at Christchurch.

14 and 15 November—Wanganui A. and P. at Wanganui.

14 and 15 November—Whangarei A. and P. at Whangarei.

15 November—Taieri Agricultural Society at Outram.

19 November—North Otago A. and P. at Oamaru.

21 and 22 November—Egmont A. and P. at Hawera.

*21 and 22 November—Nelson A. and P. at Nelson.

22 November—Courtenay A. and P. at Kirwee.

22 November—Waimate A. and P. at Waimate.

22 November—South Otago A. and P. at Balclutha.

25 and 26 November—Otago A. and P. at Dunedin.

27, 28, and 29 November—Auckland Metropolitan A. and P. at Auckland.

*28 and 29 November—Stratford A. and P. at Stratford.

29 November—Kaikohe A. P. and H. at Kaikohe.

29 November—Motueka A. and P. at Motueka.

29 November—Tokomairiro A. and P. at Milton.

29 November—Winton A. and P. at Winton.

December

*2 and 3 December—Gore A. and P. at Gore

6 December—Whangaroa A. and P. at Kaeo.

6 December—Hauraki A. and P. at Paeroa.

6 December—Helensville A. and P. at Helensville.

6 December—Wyndham A. and P. at Wyndham.

*9 and 10 December—Southland A. and P. at Invercargill.

*The Department of Agriculture exhibit will be staged at this show.

Radio Broadcasts

RADIO broadcasts to farmers will be given from 2ZA Palmerston North at 12.30 p.m. as follows:—

6 October—"Bloat", by I. M. Macfarlane, Veterinarian, Department of Agriculture, Palmerston North.

13 October—"Making the Best Use of Phosphate Supplies", by B. A. J. Smith, Fields Instructor, Department of Agriculture, Palmerston North.

20 October—"Importance of Successional Planting in the Garden", by B. P. Coleman, Horticultural Instructor, Department of Agriculture, Palmerston North.

27 October—Y.F.C. session, conducted by I. G. Tabor.

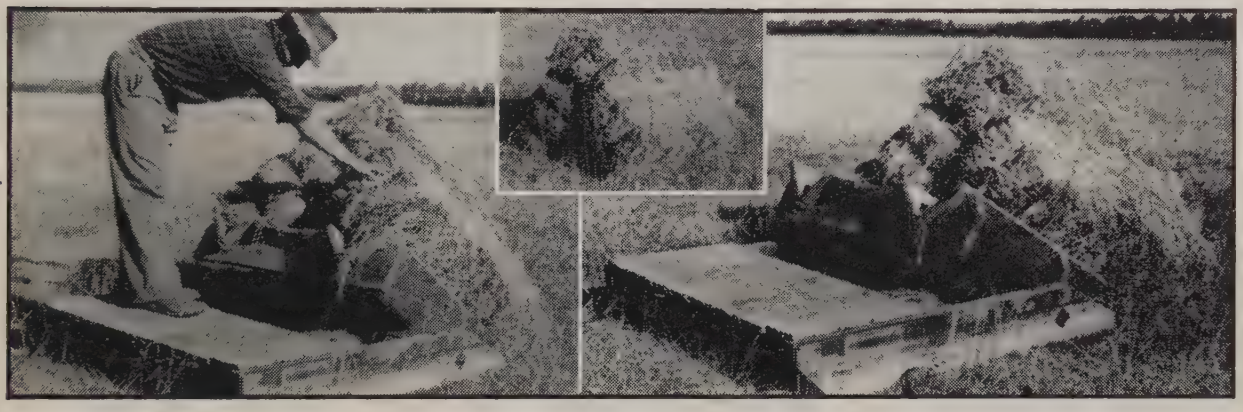
An Improved Sledge for Stooking Baled Hay

WITH the help of modern machinery considerable quantities of hay are being saved each year and any small improvement that will facilitate handling is always welcome. It is usual to attach to the rear of an automatic pick-up baler a sledge on which the bales are stacked as they are ejected from the baler and from which they are dropped at intervals to facilitate carting. Many types of sledges are used, and the numbers of bales collected before dropping vary according to the requirements of the operator.

An Ealing farmer, Mr. A. Mackenzie, has made a sledge of an improved pattern that will deposit the bales in rows already stooked so that no further handling is necessary until they are carted. The stooked bales will turn considerable rain and may be left in the paddock if the hay was not quite mature when baled. The sledge, which is illustrated on this page, is simple in construction and easy to work.

—R. INCH,
Fields Instructor,
Department of Agriculture,
Ashburton

Bales on the sledge in stooked position ready to tip. The platform gives good standing room and can be used for carrying extra bales.



Left—Light pressure on the front of the bales tips the rear end of the sledge. Right—The bales sliding off the sledge. Inset—The bales left stooked.

A rear view of the sledge showing the construction and the method of attaching the tipping unit to the crossbar.

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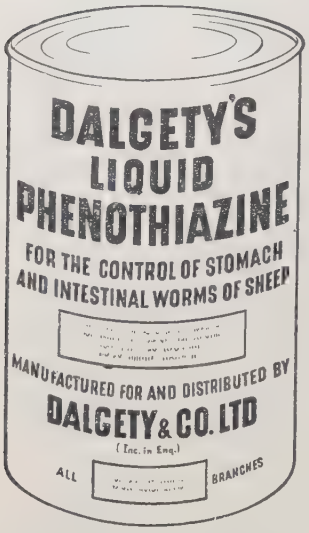

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Growing Peas for Canning in Pukekohe District

THE growing of peas for canning has increased considerably in New Zealand in recent years, the demand from the Forces during the war for canned vegetables having acted as a stimulus to the canning industry. This article by T. C. R. Dawe, Horticultural Instructor, Department of Agriculture, Pukekohe, describes the growing of peas for canning in the Pukekohe district.

IN 1944 some 400 acres only were grown in the Pukekohe district, but in 1945 and 1946 the area of peas grown for canning and processing increased rapidly and reached a peak of approximately 1200 acres. With the cessation of hostilities a steep decline occurred, but recently good overseas and local market prospects have stimulated production and about 800 acres are grown under contract to canners annually.

Pea crops are grown by farmers as well as market gardeners. In fact farmers grow the major portion of the acreage, generally on land which is to be resown into pasture. Market gardeners grow peas as a catch crop and sow in rows 15 to 20in. apart at the rate of 2½ to 3 bushels of seed per acre. These peas are planted in rows to facilitate weeding. Farmers generally sow peas with a grain drill or broadcast them, and for weed control give several strokes with light harrows. Harrowing can be carried out until plants are about 4in. high. In a few instances chemical weed control is practised.

Above—Cutting a crop with a tractor mower with pea bar fitted. Below—A mechanical loader.

Soil Types and Rotation

The soil types of land about Pukekohe used for peas are mainly Hamilton and Patumahoe clay loams; peas are also grown on the Karaka complex silt loam and clay loam which extends from north of Pukekohe to the Manukau Harbour. The first two soil types produce much more leaf and more tender peas than the last.

On market gardens peas generally follow early potatoes, and several discings and harrowings are all that are necessary to procure suitable tilth for sowing. Where pasture land is used for peas preparatory cultivation consists of ploughing to a depth of 6 to 7in. followed by several strokes with discs and tine harrows. After sowing,

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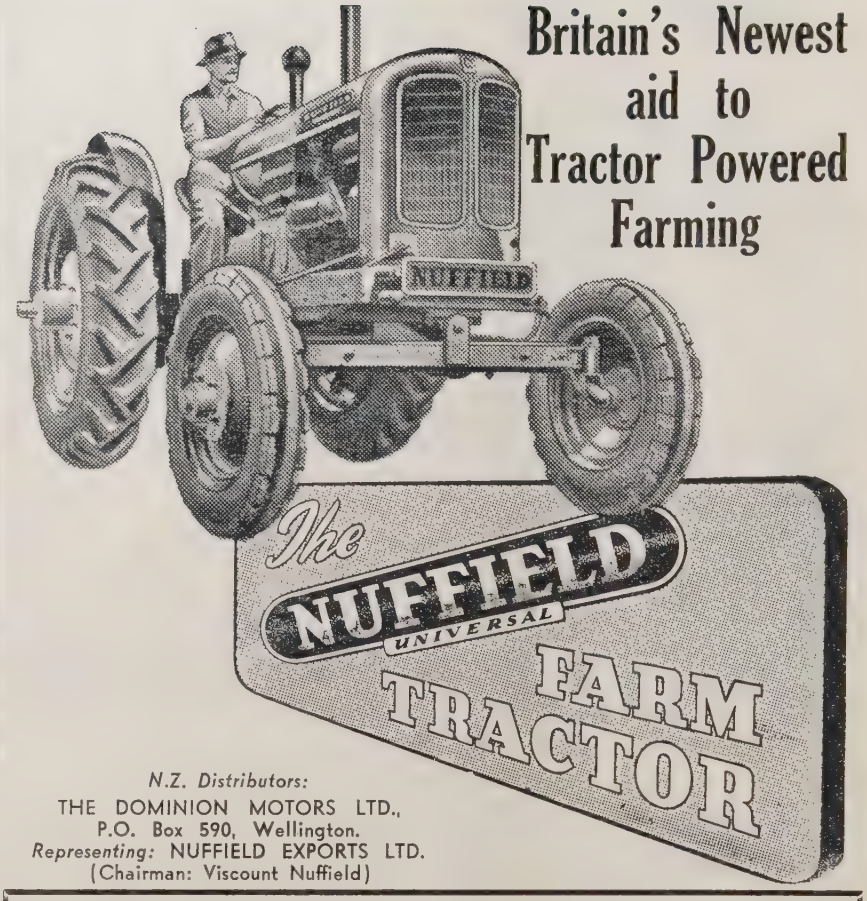

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Manuring

Manurial programmes differ somewhat. Market garden land generally has sufficient carry-over of fertiliser for the pea crop, and it has been found that good crops can be produced with the addition of 10cwt. of lime only per acre. Farmer growers add from 5 to 7cwt. per acre of phosphatic fertiliser and up to 5cwt. of lime per acre.

Soil Improvement

Peas are a leguminous crop and by bacterial action store nitrogen assimilated from the air as complex protein compounds in their root nodules. When the plant dies these nodules are broken down by soil bacteria to form soluble nitrogenous compounds readily available to the following crop.

On the whole the growing of peas for canning by market gardeners is considered economical, but not particularly remunerative. The farmer who wishes to renew his pasture finds peas a profitable catch crop, and the cultivation for the crop leaves land in much better condition for sowing down than it would be if ploughed straight out of old pasture.

Part of a typical Greenfeast pea crop in flower.

Variety, Yields, and Quality

The variety grown for canning peas in Pukekohe is Greenfeast, which gives better yields than other varieties and matures more evenly. Sowing begins in mid-August and successional sowings are made until the end of November.

Early sowings do not yield as high as mid-season or late crops, average yields being about 1 ton of shelled peas at the viner per acre for early crops and from 25 to 30cwt. for mid-season and late crops.

The quality of canned peas depends mainly on the stage of maturity at harvesting. To assist in determining when the peas are ready for harvesting the Marketing Department has installed a "tenderometer" at their cannery at Pukekohe and this appliance is used for maturity tests before harvest and after vining.

Pre-harvest maturity tests are made with a representative sample of peas taken from the field to be harvested. The peas are hand-shelled before being placed in the testing machine to determine their firmness, which registers on a graduated dial. The optimum reading for good canning peas is between 95 and 100, and pre-harvest readings are generally expected to be some 6 to 10 points lower. Readings advance by 4 or 5 points every 24 hours as the crop reaches maturity.

[*Sparrow Industrial Pictures Ltd. photo.*

Vines being fed into viner for shelling.

Harvesting

Mechanised harvesting of the pea crop is usually carried out on farmer growers' areas, but on market gardens more hand work is found necessary. Farmers use grass mowers fitted with a pea bar for cutting the vines, which are raked into windrows and loaded on to motor trucks by mechanical loaders. Market gardeners usually cut the vines with scythes and hand fork them on to motor trucks for delivery to viners.

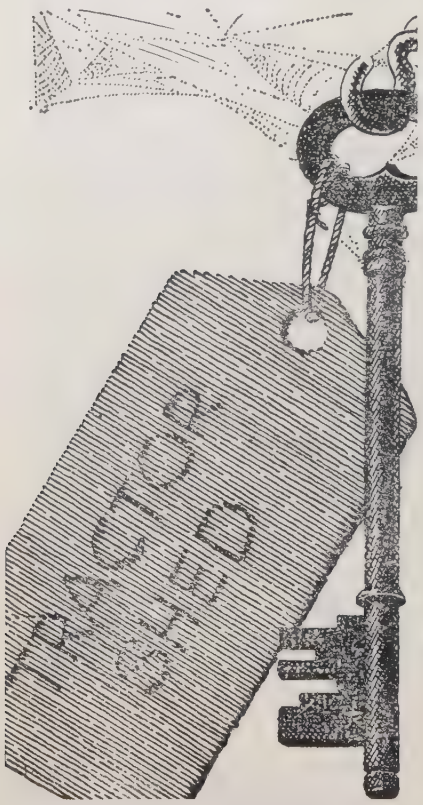
When vines are particularly green and sappy they are allowed to lie cut in the field for a few hours to wilt partially; this decreases the total weight to be carted to viners, and if vines are wilted judiciously, there is no reduction in the grade of the vined peas.

Waste vines and trash from the factories are sold for silage and are also sought by farmers for winter cattle feeding. Nurserymen also use pea vines for compost.

Pests and Diseases

Pests and diseases in pea crops are not serious in the Pukekohe district, the major problem being collar rot, caused by the fungus *Ascochyta pisi* and closely allied species. The symptoms are dark brown or purplish black lesions, which encircle the stems, particularly at ground level. Infected seeds are usually slightly discoloured and may show circular, brown, sunken spots.

Infection may be severe in spring and autumn, being carried by seed, soil, and infected pea refuse and spread by rain and insects. Control measures are rotation of crops and use of clean seed. Partial control may be obtained by dusting seed with copper carbonate and is advisable in districts where moist conditions prevail during early and late sowings.



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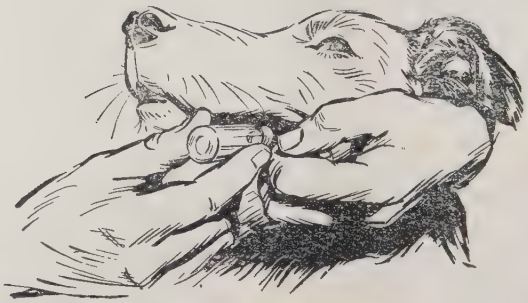

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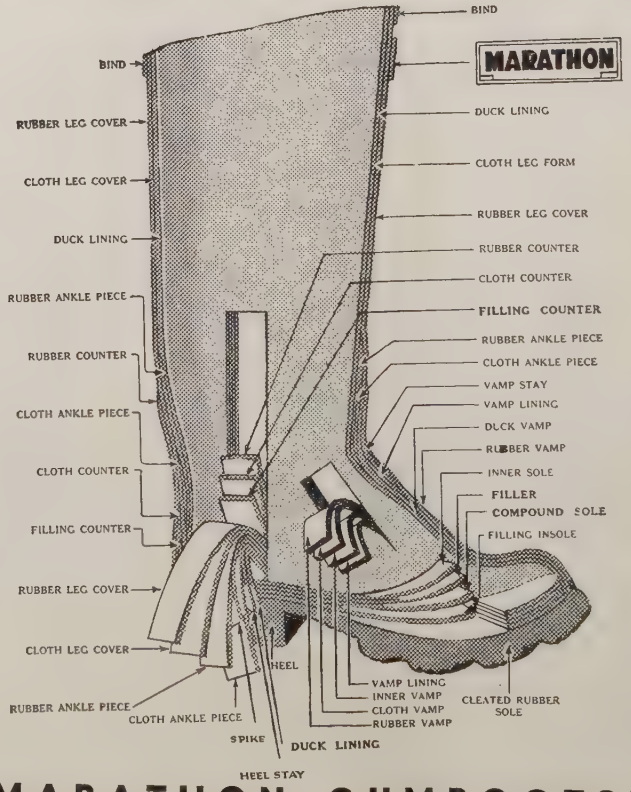
Don't feed raw liver or other raw sheep offal to the dogs. Boil offal thoroughly first to kill infection. Otherwise burn or bury it. MAKE CERTAIN YOUR DOG IS NOT A DANGER TO YOU, YOURS, AND OTHERS.

HYDATIDS must be stamped out!

16.5



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NITROGENOUS FERTILISERS

DURING recent years the Extension Division of the Department of Agriculture has greatly expanded its field trial work with nitrogenous fertilisers, particularly in testing their value for increasing grass-seed crops, hay and silage crops, and winter and early-spring grass.

PERENNIAL RYEGRASS SEED

MACHINE-DRESSED weights of 12 perennial ryegrass seed crops treated with various rates and forms of nitrogenous fertilisers have been obtained in recent years. From these trials it appears that on an average, but not in every case, nitrogenous topdressing improves the germination and purity of seed and almost invariably increases yields. In most trials the increase of machine-dressed seed of treated plots over untreated plots was from 30 to 40 per cent. On the basis of pure germinating seed per acre, however, increases of more than 100 per cent. were obtained. Most of these trials were shut up and topdressed in early November, which may be rather late. Two hundredweight of nitrogenous fertiliser, whether sulphate of ammonia or a proprietary ammonium nitrate : lime mixture of similar nitrogen content (20 per cent.), was almost always slightly inferior to 4cwt. per acre, but only rarely were higher yields obtained by the application of 6cwt. per acre. No differences in efficiency between sulphate of ammonia and the ammonium nitrate : lime mixture were found. At rates of 4 to 6cwt. per acre lodging and some degree of suppression of clover growth were common and it is thought therefore that where seed is grown as a catch crop light dressings of 1 to 3cwt. per acre are suitable, but where the main object of a pasture is the production of successive high-quality seed crops dressings of 4cwt. or even 6cwt. of sulphate of ammonia or ammonium nitrate : lime mixture per acre might be well worth while. At present there is some evidence to suggest that early shutting up and early topdressing increases seed yield. It is known, however, that by such practices losses from blind seed disease may be reduced and the benefits of early shutting up and topdressing may be attributable to causes other than the time of applying a nitrogenous fertiliser.

SHORT-ROTATION RYEGRASS

THE effects of nitrogenous fertilisers on short-rotation ryegrass were measured in two trials. In both cases yield increases were striking. When compared with yields of perennial ryegrass under comparable conditions in one trial yields of short-rotation ryegrass after topdressing with sulphate of ammonia at 2cwt., 4cwt., and 6cwt. per acre increased by 33 per cent., 66 per cent., and 100 per cent. respectively; the yield of perennial ryegrass seed was increased by only 12 per cent., 30 per cent., and 45 per cent. In the second trial even better responses were obtained which, however, because of heavy losses in the swath could not be measured accurately.

COCKSFOOT

THE cocksfoot seed trials laid down over the last 2 years have reflected the variability and the high percentage of poor crops which are often a feature of commercial cocksfoot seed production. Sulphate of ammonia was compared with the ammonium nitrate : lime mixture, and autumn and spring topdressings were compared with spring topdressings only. From results so far it appears that under ordinary commercial conditions sulphate of ammonia is equal to the ammonium nitrate : lime mixture and that autumn and spring topdressings are slightly superior to spring topdressing alone. The trials also confirmed that nitrogenous topdressing alone does not change a poor crop into a good crop. One of the reasons for this may well be that nitrogenous fertilisers also increase the vigour of weeds and unwanted grasses and their application is therefore worth while only on reasonably good stands of cocksfoot or cocksfoot and clover, and it is here that increases of 70 to 80 per cent. in seed yield were obtained. The beneficial effect of nitrogenous fertilisers on the purity and germination of seed was more marked in the cocksfoot trials than in those of either perennial or short-rotation ryegrass seed.

SILAGE

THREE trials measured the effect of dressings of 1 and 2cwt. of nitrogenous fertilisers per acre on the yield of silage. All trials were conducted on good pastures and even without treatment yields averaged 9 tons of green matter per acre. One hundredweight of sulphate of ammonia or of a proprietary ammonium nitrate : lime mixture of similar nitrogen content (20 per cent.) raised the average yield by a further 22 per cent. and 2cwt. per acre by 30 per cent., and increases in green weight ranged from 1.5 to 3 tons per acre. Nitrogenous topdressing for silage production may therefore be worth while even at the present high prices of these fertilisers. A very slight depression of clovers was noted in one of the three trials. Trials measuring the effect of nitrogenous fertilisers on hay yields, however, did not give any evidence of marked responses to nitrogenous fertilisers, though responses have been obtained in trials conducted in earlier years.

GRASS GROWTH

ONE trial measuring the effect of nitrogenous fertilisers on summer growth of an irrigated high-producing pasture in Canterbury also revealed no significant yield responses. On a poor irrigated pasture, however, the weight of pasture produced was doubled during 2 months after the application of just more than 1cwt. of sulphate of ammonia or ammonium nitrate : lime mixture. The effect of nitrogenous fertiliser for stimulation of out-of-season pasture growth during winter and early spring was measured in two trials, only one of which, in south Auckland, was satisfactory. This trial gave striking results. A dressing of 1cwt. of nitrogenous fertiliser at the beginning of June increased production over the untreated area by 160 per cent. during June and July. The extent to which nitrogenous fertilisers can increase late-autumn, winter, and early-spring growth under different conditions is being studied in a number of trials now in progress.

—C. DURING

* * * *

CONTROL OF NODDING THISTLE

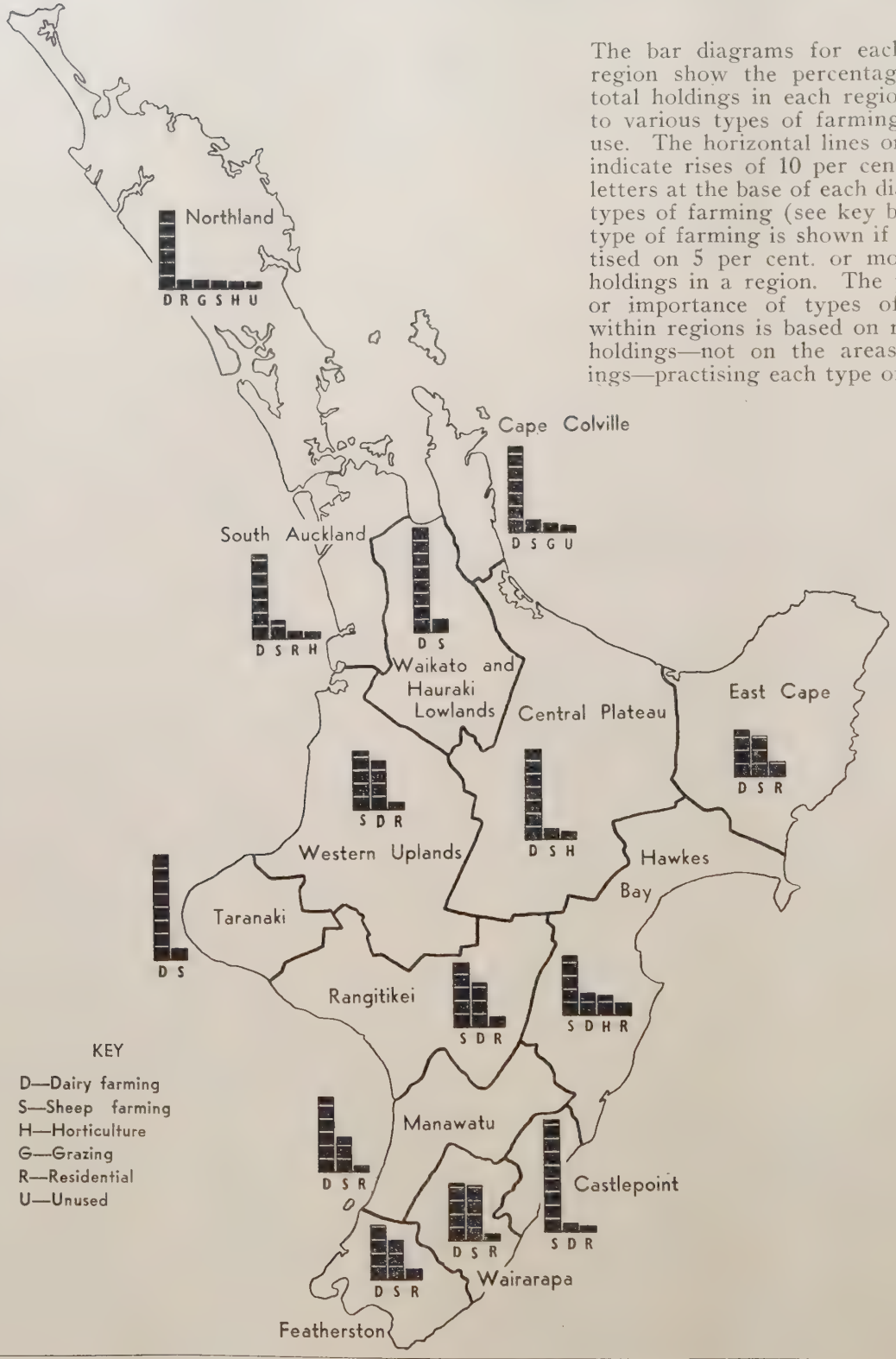
IN certain areas of New Zealand nodding thistle (*Carduus nutans*) has increased in importance in recent years. Trials have shown that, like many annual and biennial thistles, it is readily eradicated with hormone weedkillers of M.C.P. or 2,4-D acid base. The plants are most susceptible as seedlings, but excellent control is secured from the seedling stage until the plant forms the rosettes. At these stages of growth ½ to 1lb. of acid equivalent per acre of the hormone preparations mentioned is sufficient for control. After the rosette stage up until the plant begins to form flowers the concentration should be 1 to 2lb. of acid equivalent per acre. The pasture should be hard grazed and then left a week. This allows the thistles to lift above the grass so that ordinary low volume application is successful. If the thistles are partially covered by grass, a higher volume of water should be used to wet them with the spray mixture. All preparations of M.C.P. and 2,4-D hormone base are successful, but to avoid clover damage the water-based sodium and amine salt preparations should be used instead of the oil-based esters.

—R. INCH

POPULARITY OF VARIOUS TYPES OF FARMING
(By Regions)

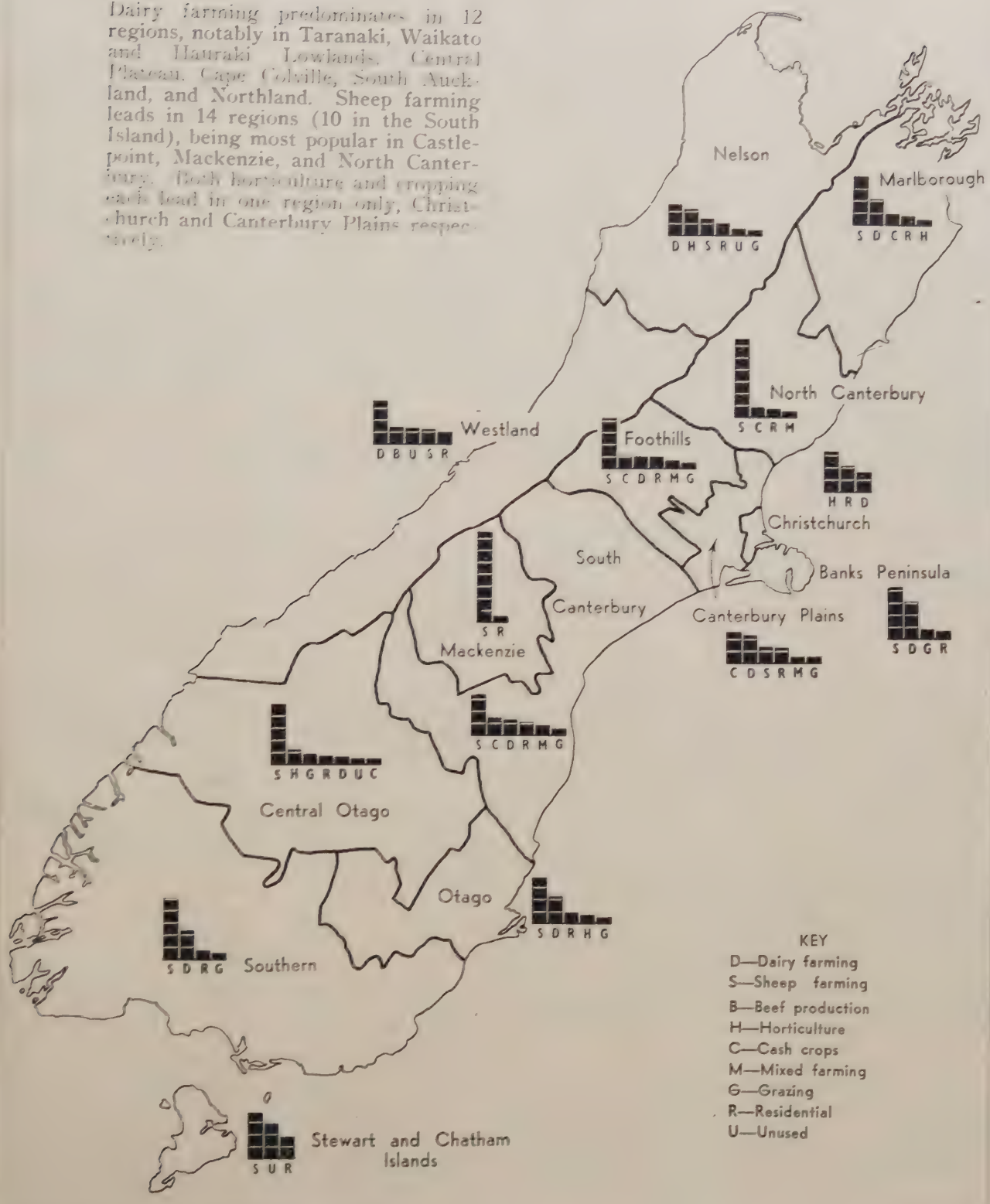
By W. N. PATON, Senior Investigational Officer, Department of Agriculture, Wellington

The bar diagrams for each farming region show the percentages of the total holdings in each region devoted to various types of farming or other use. The horizontal lines on the bars indicate rises of 10 per cent. and the letters at the base of each diagram the types of farming (see key below). A type of farming is shown if it is practised on 5 per cent. or more of the holdings in a region. The popularity or importance of types of farming within regions is based on number of holdings—not on the areas of holdings—practising each type of farming.



POPULARITY OF VARIOUS TYPES OF FARMING

Dairy farming predominates in 12 regions, notably in Taranaki, Waikato and Hauraki Lowlands, Central Plateau, Cape Colville, South Auckland, and Northland. Sheep farming leads in 14 regions (10 in the South Island), being most popular in Castlepoint, Mackenzie, and North Canterbury. Both horticulture and cropping each lead in one region only, Christchurch and Canterbury Plains respectively.



Care of Livestock during October

Contributed by the Animal Research Division

CATTLE TICK CONTROL

WHERE cattle ticks are plentiful spraying or dipping should be carried out in November and December to prevent tick worry and kill the adult female ticks before they lay their eggs.

MATING OF DAIRY COWS

Before each cow is mated two heat periods or an interval of at least 30 days should be allowed after calving. Cows mated before this period are less likely to get in calf, and the chances of contaminating the bull are increased. Hand mating should be practised and accurate records kept showing the bull used and the dates of all services. Should breeding trouble occur, these records will be of considerable assistance in arriving at a correct diagnosis.

COCCIDIOSIS IN CALVES

Scouring in calves under 6 months of age is seldom due to worms. It is much more likely to be due to coccidiosis, especially if blood is present in the droppings. Effective drugs are available for treatment, but these can be obtained only on the prescription of a Veterinary Surgeon, who should be consulted.

BLACK DISEASE VACCINATION

In the east coast areas of the North Island where black disease of sheep occurs vaccination should be carried out during November or early December. This will protect the sheep against the disease, which occurs mainly in summer and autumn. Vaccine should be ordered immediately.

BLOOD POISONING FOLLOWING SHEARING

Deaths in sheep following shearing may be caused by infection of cuts or bruises with the blackleg germ. This disease can be prevented by vaccinating at least 3 weeks before shearing. Sheep which have been vaccinated previously may not require re-vaccination, and a Veterinarian or Inspector of Stock should be consulted about the best procedure.

BLOWFLY STRIKE IN EWES

In districts where crutch strike causes trouble in ewes crutching or early shearing is advised. Close supervision is necessary to detect cases so that suitable treatment can be applied before the strike becomes too extensive. When treating cases of fly strike shear the wool away to leave 1in. margin of clean skin around the affected area. Remove the maggots by tapping the area with the shears and apply some reliable non-irritant dressing. Irritant fluids such as kerosene tend to cause restrike.

BLACK-HEAD IN POULTRY

Young turkeys and poultry are affected by black-head disease and it can best be prevented by rearing these on land which has not been contaminated by adult poultry. If an outbreak occurs, kill all affected birds and move the remainder to clean ground. In the event of a bad outbreak the local Poultry Instructor of the Department of Agriculture should be consulted, as in some cases treatment may prove beneficial.

GREENLEG IN BROODER CHICKENS

Greenleg in brooder chickens occurs in poorly ventilated brooders, especially if they are over-crowded and damp. At the first sign of trouble the necessary measures should be taken to ensure that ventilation is adequate and the litter is changed if it is at all damp.

ROUND WORMS IN POULTRY

Infestation by round worms is one of the most important causes of poor development of young birds. All growing stock should be treated twice with carbon tetrachloride, once at 3 months old and again at 5 months.

SUPPLEMENTARY FEED

Supplementary feed is essential to ensure the proper feeding of cows in winter and in dry summers and to control facial eczema in autumn. As soon as more pasture is available than is necessary to meet the immediate needs of stock, the balance should be shut up for silage or hay. On a well-managed dairy farm it should be possible to shut up at least 40 per cent. of the pasture. Crop growing for fattening of weaned lambs is standard practice in South Island districts, and it could with advantage be adopted more widely in North Island districts which experience a dry summer. Crops such as thousand-headed kale and turnips in addition to providing excellent fattening feed for lambs are a splendid insurance against facial eczema. In Poverty Bay and Hawkes Bay they should be sown before the end of October so that they can be well established before dry weather sets in.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during July and for the 12 months ended 31 July 1952 with comparative figures for the same month and 12-monthly period of 1950-51, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	% inc. or dec.	Total tons in store at end of mth.
July 1952 ..	1,700	7	1,707	—	5,076
July 1951 ..	1,527	7	1,534	—	11,976
Inc. or dec. ..	+173	—	+173	+11.277	—6,900
For 12 mths. to 31/7/52 ..	156,598	2,654	159,252	—	—
For 12 mths. to 31/7/51 ..	150,638	3,033	153,671	—	—
Inc. or dec. ..	+5,960	—379	+5,581	+3.631	—

CHEESE

Period	White	Tons Coloured	Total	% inc. or dec.	Total tons in store at end of mth.
July 1952 ..	60	—	60	—	3,529
July 1951 ..	156	—	156	—	9,793
Inc. or dec. ..	—96	—	—96	—61.538	—6,264
For 12 mths. to 31/7/52 ..	90,378	751	91,129	—	—
For 12 mths. to 31/7/51 ..	102,943	1,526	104,469	—	—
Inc. or dec. ..	—12,565	—775	—13,340	—12.769	—

If these figures are converted into butterfat equivalent, there is a decrease of 0.159 per cent. in butterfat graded for the 12 months as compared with the corresponding period of the preceding season. It should be noted that the above figures refer only to butter and cheese graded for export, and that owing to diversions which may take place from time to time, they are not necessarily a true indication of production trends.

Production of Crops and Silage

Seasonal Notes by the Extension Division

THE sowing of spring crops, preparation of land for crops to be sown in early summer, and silage making now deserve close attention. Every endeavour should be made to bring the potato area up to Dominion requirements, and this covers production by individuals for their domestic use and production by commercial growers.

SEED POTATOES AS the potato area planted last season was the lowest recorded this century, seed supplies may be difficult to obtain and growers may have to plant much larger seed than normally. Whereas in the past they have found 2 to 4oz. seed most convenient, they may now find it necessary to use seed of 4 to 6oz. If this larger seed is cut in two, the halves are each equivalent to 2 to 3oz. seed. Cutting is reasonably successful with most varieties except Aucklander Short Top, although even with this variety cutting gives fairly satisfactory results if a few simple precautions are taken. When tubers are cut they should be planted almost immediately; the rows should be opened up and the seed cut, planted, and covered before the cut surfaces can dry out. The use of cut seed of all varieties would be more successful if these precautions were generally observed.

POTATO VARIETIES Aucklander Short Top (Suttons Supreme) accounts for a third of the Dominion potato crop. It is the main variety planted on the light soils of Canterbury. Quality is good and production of table potatoes high even under unfavourable growing conditions. Arran Chief is grown mainly on the heavier Canterbury soils, and in Otago and Southland is capable of very heavy yields. Though its firm skin enables it to store better than Aucklander Short Top, which is subject to damage during handling, Arran Chief is more subject to late blight than Aucklander Short Top. Dakota is a red-skinned variety which is grown on the light-to-medium Canterbury soils. It is a later-maturing variety than Aucklander Short Top and is an excellent keeper, but its deep eyes make it less popular than its other qualities would allow. Arran Banner, though classified as a main-crop variety, has found a place as an early potato, particularly in the North Island. It is subject to late blight. Growing of King Edward is practically confined to the Otago and Southland districts, where it is used before the Arran Chief crops are ready. Inverness Favourite appears to be losing favour, though it is sometimes used as an alternative to Arran Chief. Aucklander Tall Top is grown to a limited extent in areas suited to Aucklander Short Top, which it resembles; it is later maturing and therefore requires a more assured moisture supply.

—J. A. S. MILLER

* * *

SILAGE SILAGE making fits well into a system of efficient pasture management, results in paddocks being out of commission for a much shorter time than is required for haymaking, and produces a material on which cows will milk well, but care is necessary if good silage is to be made, even with the latest silage-making machinery. Early-cut paddocks should be back into grazing in about 8 weeks from being shut up and later-cut paddocks in about 12 weeks. Haymaking where paddocks are often not cut until February or March may entail the paddocks being out of commission for 4 to 5 months.

EQUIPMENT The buckrake, the front-end loader, and the forage harvester have all made a valuable contribution to silage-making equipment and promise to become more popular and to reduce the labour force required for silage making. Of the three, the buckrake appears to be of most value to the small farmer. Preparation should always be made in plenty of time before silage making begins, to avoid delays when the crop is ready for cutting. Equipment should be checked, and where a tractor and buckrake are being used the hydraulic system of the tractor should be tested. If the silage is to be made in a pit or trench, it may be necessary to trim the earth sides, clean out the bottom, and make sure that drainage is satisfactory.

ENSILING Recent research work shows that losses in food value are perhaps larger in early-cut material than in that cut a little later, but it is wise to plan an early start and to get as much material as possible made before the grass gets too stalky. The most successful dairy farmers cut as much as half their farm for silage, but even if less is cut, a start should be made toward the end of October and most of the material should be in by early December. If cutting is delayed until later in December or even January, excessive heating is difficult to prevent, resulting in dark-brown or black silage, which is of low feeding value. Young, leafy pasture growth consolidates very readily, and if it is put in with the buckrake, especially in a trench or clamp, it is likely that too little heat will be generated and sour silage will result. Such material is best wilted before sweeping and frequent spells should be given while the silage is being made. No covering should be necessary with young material. The older and more stalky the material the more consolidation is necessary. When a stack is being built with the grab stacker consolidation can be obtained only by careful spreading of the material and thorough tramping, especially near the edges. As soon as possible after the stack is completed a layer of earth 1ft. to 18in. deep should be spread evenly over the stack. Limestone is sometimes used and is quite satisfactory. Where the buckrake is used consolidation is more easily obtained, because the tractor runs over the spread material at each trip. Careful spreading is still necessary and the material should be well tramped along the edges of the pit or stack where the tractor wheels have not consolidated it. Whatever method is used in making the silage, the top of the pit or stack should be spread and tramped very carefully so that no holes will develop and allow water to enter. This is especially important if no earth covering is applied. It is recommended that where the silage is made in a trench or clamp and not covered a tractor be run over the whole top each day for about a week after the job is finished, so that a seal is made which will prevent excessive waste on the top.

—A. C. BURGESS

* * *

LINSEED THE growing of linseed as a spring-sown cash crop is becoming increasingly important in Canterbury, Otago, and Southland. In Otago and Southland the variety Bison is the most suitable, but in the drier Canterbury areas with a wider variety of soils (clay foothills to stony plains) a greater range of varieties is required. On clay soils Golden Viking is generally considered the most suitable, and Victory is preferred on light, stony soils. The variety Kato is early maturing and should be sown where this factor is important. The rate of seeding for linseed is being investigated, but work to date suggests that medium rates of 40 to 50lb. of seed per acre, depending on the size of seed, give the best results.

MANURING Although not much conclusive evidence is available about various manures applied either with the seed or as after-dressings, it is obvious that the highest yields from linseed are gained from areas ploughed out of good pasture which had been well maintained with lime and phosphate before ploughing was done for the linseed crop.

—J. D. WRAIGHT

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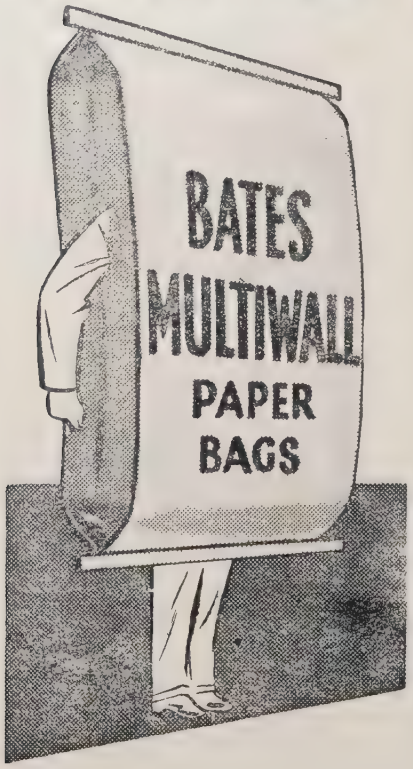

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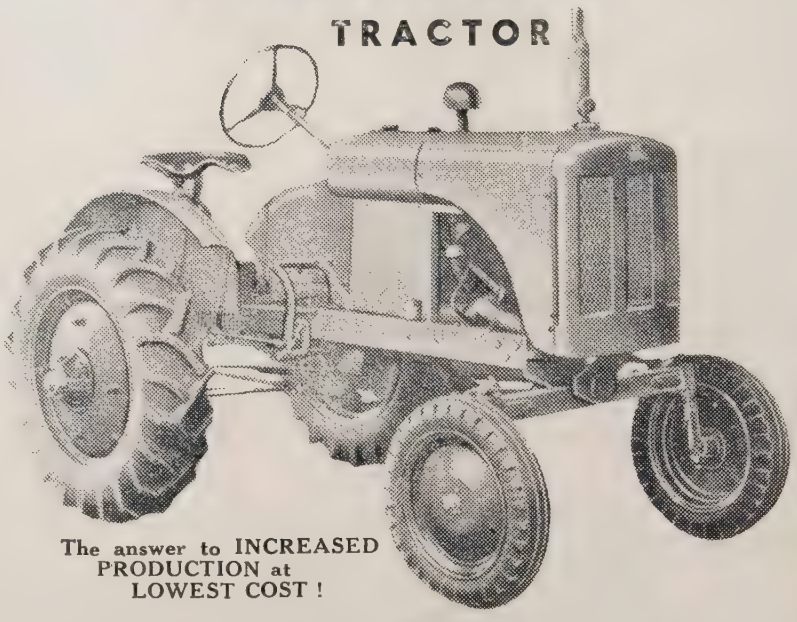

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Spring Examination of Bee Colonies

Seasonal Notes for the Domestic Beekeeper

THE advent of spring, with its warmer days and improved weather, permits bees to collect new supplies of pollen and nectar. Hives will now need attention, and work to be done in the domestic apiary is discussed in this article by T. P. J. Williams, Apiary Instructor, Department of Agriculture, Hamilton.

SPRING may be regarded as the beginning of a new beekeeping season. Many trees and shrubs are blooming and new loads of pollen are carried into the hive. Brood rearing will have begun and an inspection of the hive is necessary to ensure that the bees have sufficient stores of honey, to examine the brood for the presence of disease, and to see if the queen is in good condition.

A fine, warm day should be chosen when making this examination. Great care must be taken not to have the hive open too long or to have honey unduly exposed, for if these precautions are not observed, robber bees from other hives may be attracted and the hive attacked.

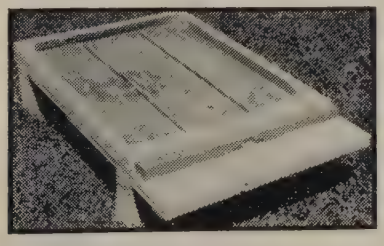
Cleaning the Bottom Board

During winter considerable quantities of rubbish accumulate on the bottom board, and as the bees are clustered, it remains there until spring, when they are confronted with a huge task in clearing it away. It is a fairly simple job for a beekeeper to remove the hive to a temporary stand and to clean the board. The rubbish is easily removed with a flat scraper or hive tool.

The bottom board should be put back into position up off the ground on a firm stand; four bricks are quite a suitable foundation. This allows air, which will keep the bottom board dry, to pass underneath the hive. It is also advisable to have the board tilted forward slightly so that water does not accumulate at the back of the hive. Both these manipulations help in preserving the bottom board.

Cleaning Hive Entrance

The entrance to the hive should not be obstructed by grass and weeds. It not only looks untidy but is very unprofitable, as field bees, heavily laden on their homeward flight, strike the grass and fall to the ground, where they die in large numbers.



A bottom board from which rubbish has been scraped and which is ready to be placed back into position. The rubbish has caused the wood in the centre and back to rot.

Left—A hive entrance blocked by grass restricts bees in free flight and causes hive material to rot rapidly. Right—A hive clear of grass and weeds and resting on concrete blocks.

In spring grass and weeds are just beginning to make fresh growth and this is the opportune time to kill them. The ground about the hive should be dug over with a spade and a liberal sprinkling of cheap agricultural salt applied. This should keep the hive clear of grass and weeds for at least the rest of the season.

Stores

When the hive was closed down for winter it should have been left with about 40 to 50lb. of honey in the combs. Little of this is consumed during winter; however, once breeding begins heavy inroads are made into stores of honey and pollen, for it takes about a comb of honey to rear a frame of brood. At this rate a large quantity of honey is used in a surprisingly short time. At the beginning of September the hive requires about 30lb., or six full combs of honey.

Feeding

The latter half of October is usually the most critical time for bees, as there is a dearth of nectar and they may have to be fed. If the beekeeper has had enough foresight to keep a few frames of honey from the previous season, feeding the hives will be simple. The beekeeper runs a grave risk when he feeds honey to the bees if its source is not known, for it may carry disease.

A solution of sugar syrup is a convenient substitute for honey to feed bees. It is prepared by mixing 1 part of sugar to 1 part of water by volume, the sugar dissolving readily in hot water. It is fed to the bees when lukewarm.

There are various types of feeders, but the most simple for the domestic beekeeper is a 5lb. honey tin with a friction lid. A few very small holes are punched in the lid with a nail. The tin is then filled with the syrup, inverted, and placed over a hole cut in the hive mat. An empty super should be placed on the hive to provide space for the tin and the hive cover replaced firmly in position.

The syrup should be fed to the bees as late in the day as possible, no more than they are able to take during the night being given to them. The entrance to the hive is reduced and the bees are disturbed as little as possible. Care should be taken not to spill any syrup near the hive, and with reasonable care robbing will be avoided.

Renewing Combs

In spring an excellent opportunity is afforded the beekeeper for culling out poor combs, as the bees will have extended their activities over only a small portion of the hive. Combs with a large amount of drone and irregular cells or old and thick combs with pieces torn away are no longer suitable either for breeding or for storing honey. They are better removed and replaced with selected worker combs from which the previous season's crop was extracted.

Disease

A close examination should be made of all brood to ascertain if the colony is free from disease. One of the most serious diseases of bees in New Zealand is American foul-brood (*Bacillus*

Feeding syrup to bees by using a 5lb. honey tin placed over a hole cut in the hive mat.

larvae), which, as its name suggests, is a disease of the brood and does not affect the adult bee. The infected larvae usually die just after the cells are capped over.

The cappings of healthy brood may vary from a straw colour to dark brown according to general conditions in the hive and the material available to the colony, but all cappings should be of a uniform colour. The capping is built over the cell in a convex form, but where disease is present the cell will have a sunken or concave capping darker than the surrounding healthy brood and perhaps of greasy appearance. In some cases the capping becomes punctured.

When these symptoms appear the capping should be removed from the cell and the larva examined. If it is affected with foul-brood it will have lost its pearly-white appearance and will have assumed a coffee-brown colour. The simple test for American foul-brood is to probe the dead larva with a thin splinter of wood such as a matchstick, giving the stick a slight twist and withdrawing it slowly from the cell. If the dead matter adheres to the stick and ropes out to a distance of about 1in., it is proof that the colony is infected with the disease.

There is only one sure method of eradicating American foul-brood and that is to burn bees, combs, and honey of the infected colony and to sterilise thoroughly all remaining equipment. Particulars of the procedure may be obtained from the local Apiary Instructor of the Department of Agriculture.

Control of Rushes

OF the five tall rush species in New Zealand the two most prevalent species (*Juncus effusus* and *Juncus pauciflorus*) can be eradicated with hormone weedkillers; no trials have been conducted on the less common rushes. These two species nearly always occur in low-lying areas and are identified in the field by the fact that both are dark green and usually have stems with solid centres and spreading seed heads. *Juncus effusus* has soft stems and is often grazed low by stock.

Trials have shown that the best results are obtained if the rushes are mown in October or November and treated in January or February, when the regrowths are 12 to 18in. high. Mowing, particularly for the more resistant species *Juncus pauciflorus*, is essential to remove the second-year seeding stems that are too glossy to absorb the weedkiller.

The most effective preparations are the oil-based esters of 2,4-D applied with water as a diluent at 1 to 2lb. of acid equivalent per acre for *Juncus effusus* and 2lb. of acid equivalent per acre for *Juncus pauciflorus*. With boom application fine nozzles should be used and the spray should be atomised as much as possible so that the spray particles are retained by the stems of the rushes. Best results are obtained if the spraying is carried out on a hot, humid day when the stomata (breathing pores) of the rush stem are widely open.

—*L. J. MATTHEWS,*
Weeds Research Officer,
Department of Agriculture,
Wellington

Peppermint Oil Production Trials

By I. L. ELLIOTT and G. ADAM, Rukuhia Soil Research Station, Department of Agriculture, Hamilton

PEPPERMINT oil has a range of uses, mainly as flavouring for toothpaste, chewing gum, and a variety of sweetmeats, besides being extensively used in the manufacture of cordials. At present all the material used in this country is imported from overseas, but perhaps trials being carried out at the Department of Agriculture Soil Research Station, Rukuhia, to determine the possibility of peppermint oil production from New Zealand's peat soils will open the way for local production of at least part of the country's requirements.

ON a visit to the United States some 3 years ago one of the authors observed that the production of peppermint oil from crops grown on some of the peat soils of that country is apparently a flourishing industry, and it was decided to obtain some plant material for study.

A number of cuttings were obtained through the courtesy of Professor Ellis of the Horticulture Department, University of Indiana, who is an authority on the growth of peppermint and production of peppermint oil.

For the first season the problem was to multiply the stock of plant material, and this was done by growing it in special peat beds in the nursery. The following year ample material was available for a small field-scale trial.

The mint was planted out on 11 September, individual cuttings 6 to 9in. long being set in shallow furrows 2ft. apart with approximately 1ft. between cuttings.

Lime Requirements

The land had been prepared previously by deep cultivation with a rotary hoe and the incorporation of 10 tons of lime per acre to raise the pH to about 5.5. It should be emphasised that this trial was carried out on raw peat and that the quantities of lime exceed what would be required on areas already under cultivation.

Fertiliser at the rate of 400lb. per acre was broadcast over the area at the time of planting. It comprised a mixture of approximately 60lb. of sulphate of ammonia, 220lb. of serpentine superphosphate, 120lb. of muriate of potash, and 25lb. of copper sulphate.

During the growing stage the crop was kept cleanly cultivated to control weed growth. This is essential for the first year because weeds in the crop can affect the quality of the oil very considerably. After the first year the crop grows so densely that it covers the entire area and further cultivation is unnecessary. In subsequent years the whole area is ploughed during the dormant period and the mint allowed to regrow through the furrows.

On 7 December a further side dressing of 1cwt. of sulphate of ammonia per acre was applied to the crop.

Time of Harvesting Important

Harvesting was begun on 4 February just as the mint started to flower. The time of cutting is important, as it affects the yields and quality of oil. After cutting, the crop is allowed to wilt before being gathered in and placed in the still for the extraction of oil.

The yield of oil was about 50lb. per acre, which compares more than favourably with yields recorded overseas.

The area where the mint was planted was part of the vegetable plot in which three different heights of water-table were maintained during summer. At all three levels, 8in., 16in., and 24in. below the surface, the plants showed excellent root development, but there was no significant difference in the yield from the different water-tables.

Samples of the oil were sent to the United States for assessment on the basis of quality and are said to compare favourably with samples available from a variety of sources.

Preparations are under way to conduct a trial on a larger area with peppermint and spearmint to investigate the optimum amount of lime for mint production on New Zealand peat and the right time of harvesting under New Zealand conditions.

The vegetable trial area on peat soil at the Department of Agriculture Soil Research Station, Rukuhia, on which trials have been carried out to determine the possibility of peppermint oil production on New Zealand's peat soils.

Fat-stock Production Survey of Wairoa County

By R. T. du FAUR, Research Officer (Farm Management), Department of Agriculture, Palmerston North, and R. H. Scott, Land Utilisation Officer, Department of Agriculture, Wellington

FEWER fat stock have been raised in recent years in Wairoa County and there has been a considerable proportion of light-weight lambs. Concern at this trend has been expressed by farmers and the freezing company at Wairoa, and to clarify the problem of fat-stock production within the county the Department of Agriculture made a survey with the following objectives: To ascertain the area and type of land available for stock fattening; to study the relationship of supplementary crops to stock fattening and the possibilities of fodder crop production; to investigate the importance and possibilities of pasture improvement by topdressing and oversowing on hill country or by renewal on ploughable land, and to investigate farm management and/or other factors in fat-stock production.

WAIROA County has an area of 879,000 acres, of which 705,000 acres or 80 per cent. is occupied. For the 1949-50 season the land was utilised as follows:—

TABLE 1—LAND UTILISATION IN WAIROA COUNTY 1949-50

	Acres
Grasses, clovers, and lucerne ..	437,700
Unimproved land	262,600
Green fodder and root crops ..	2,200
Crops (mainly maize and vegetables for processing)	600
Plantations, orchards, market gardens, and private gardens ..	1,600
Fallow land	300
Total	705,000

On this occupied area there were run 661,000 sheep, of which 410,300 were breeding ewes and 99,900 cattle, which included 7300 cows in milk.

Topography

Practically the whole of the county is hill country and of the total area of 879,000 acres about 310,000 acres or 35 per cent. is over 2000ft. high. The greater part of this area is in native forest, particularly in the north-west around Lake Waikaremoana, where the annual rainfall is over 80in. This area is not suitable for farming. Another smaller area of high country is in the north-east, where the slopes are steep and the country is difficult to farm. The total area of flat land is approximately 33,000 acres or 4 per cent. of the total area.

Climate

The annual rainfall ranges from over 80in. in the north-west to 50 to 60in. further east, rising again to over 100in. on the higher hill country on the north-east coast.

TABLE 2—AVERAGE ANNUAL RAINFALL

Station	in.
Waikaremoana	76.25
Eripeti	75.60
Wairoa	48.54
Te Maori	56.61

Waikaremoana and Eripeti are in the north-west and Te Maori is in the southern part of the county.

The rainfall is fairly evenly distributed, the lowest recordings at Wairoa being for the months November and December, when the average fall is 2.7 and 2.32in. respectively. At Waikaremoana and Eripeti the lowest fall occurs during December, but even then the average does not fall below 4in. A feature of the monthly rainfall data for the county is the wide deviation which occurs from the average figures. The temperature range is not great, the mean temperature for June for much of the area being approximately 48 degrees and for January 62 degrees.

Technique of Survey

The technique used for the survey was as follows:—

1. Discussions were held between interested parties—the executives of the freezing company, stock buyers, farmers, and departmental officers.

2. It was apparent that some farmers were adopting reasonably good management techniques and had partly improved or improved farms. It was assumed that those who had been using reasonable quantities of fertilisers for a few years were in this group.

3. From this list a group of farmers situated on the two major land classes in the county—the Taupo sandy silt soil group and the Taupo ash on mudstone group—was selected. These two major land classes cover approximately 425,000 acres or about 60 per cent. of the occupied area of the county.

4. For each farm selected in 3 another farm of somewhat similar size but which received little or no fertiliser was chosen. These farms were also on the two main land classes. For classification purposes those farms under 3, where pastures were being

HEADING PHOTOGRAPH: Typical Wairoa hill country; approximately 95 per cent. of the area of the county is hill country.

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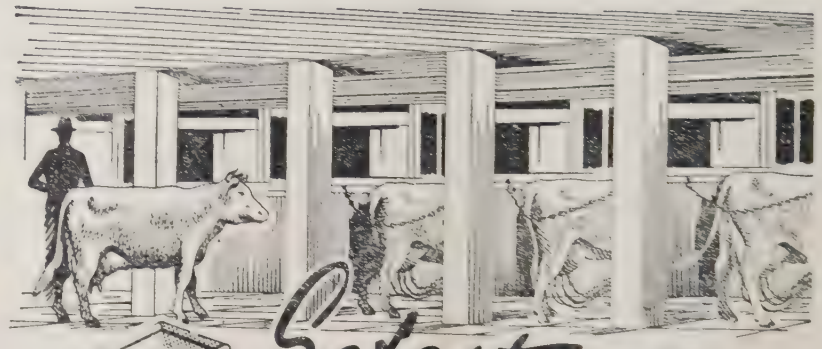

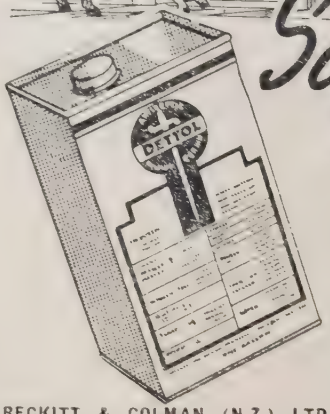

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Wairoa hill country. At left are fairly good pastures established after burning of the bush.

improved, were classed as "good" and those under 4, where little or no pasture-improvement work was being done, were classed as "poor".

5. For each farm information was obtained on the class of pasture, area of farm capable of being ploughed or disced, and farm- and stock-management. The sizes of farms in each classification were:—

TABLE 3—SIZES OF FARMS IN PASTURE-IMPROVEMENT GROUPS

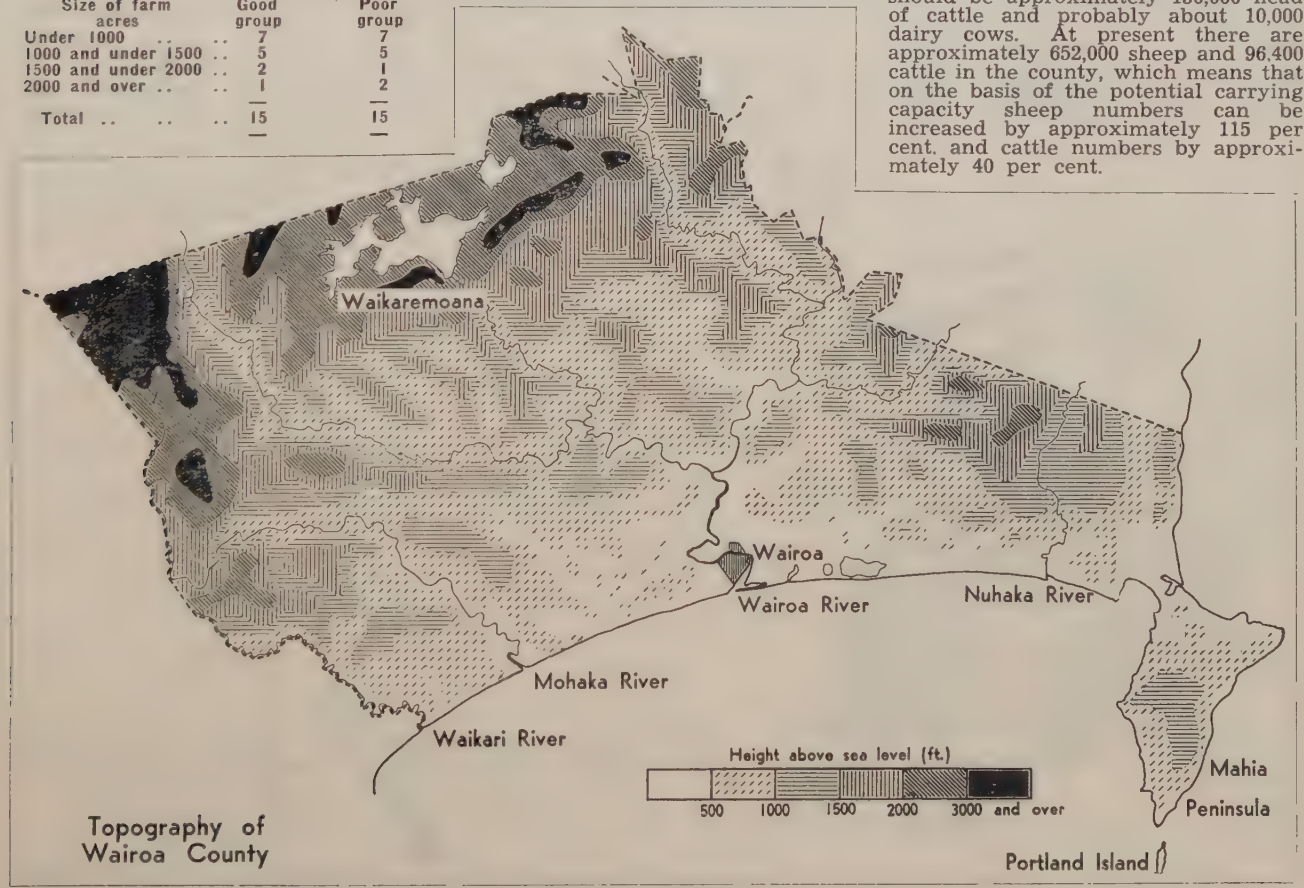
Size of farm acres	No. of farms: Good group	Poor group
Under 1000	7	7
1000 and under 1500 ..	5	5
1500 and under 2000 ..	2	1
2000 and over	1	2
Total	15	15

Results

The results of the survey were as follows:—

1. **The area and type of land available for stock fattening:** The method adopted to compute the potential carrying capacity of the county was to divide the district into land classes similar to the land classification system drawn up by Grange and Smallfield. Under this system soil types are grouped according to two factors, topography and the degree to which white clover and subterranean clover can be established. Potential carrying capacities were then computed for each land class, being based on the carrying capacity already reached on the highest-producing farm on each land class.

It is considered that if the 563,700 acres under 1 and 2 in Table 4 are developed on lines similar to some of the better farms in the area, the county should carry at least 550,000 ewes for fat-lamb production, 840,000 for the production of store sheep, and some fat lambs. In addition there should be approximately 130,000 head of cattle and probably about 10,000 dairy cows. At present there are approximately 652,000 sheep and 96,400 cattle in the county, which means that on the basis of the potential carrying capacity sheep numbers can be increased by approximately 115 per cent. and cattle numbers by approximately 40 per cent.



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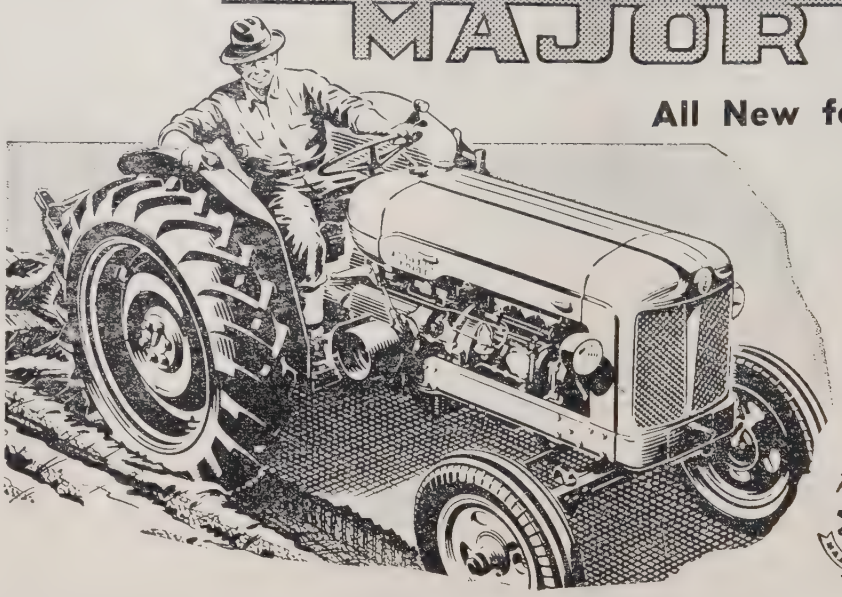

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Typical of land which has reverted to scrub and fern. Of the total area of the farms included in the survey 16 per cent. was heavily infested with fern and scrub.

TABLE 4—CLASSIFICATION OF LAND IN WAIROA COUNTY ACCORDING TO ITS POTENTIAL USE AND ESTIMATED POTENTIAL CARRYING CAPACITY OF EACH LAND CLASS

Potential land use	Area acres	Stock	
		Cattle	Sheep
1. Dairy stock for milk and sheep and cattle mainly for meat	144,800	37,000*	551,300
2. Sheep for meat and wool and store sheep and cattle for sale to f	418,900	97,800	840,000
3. Doubtful agricultural value	315,300	4,800	40,000
Total	879,000	139,600	1,431,300

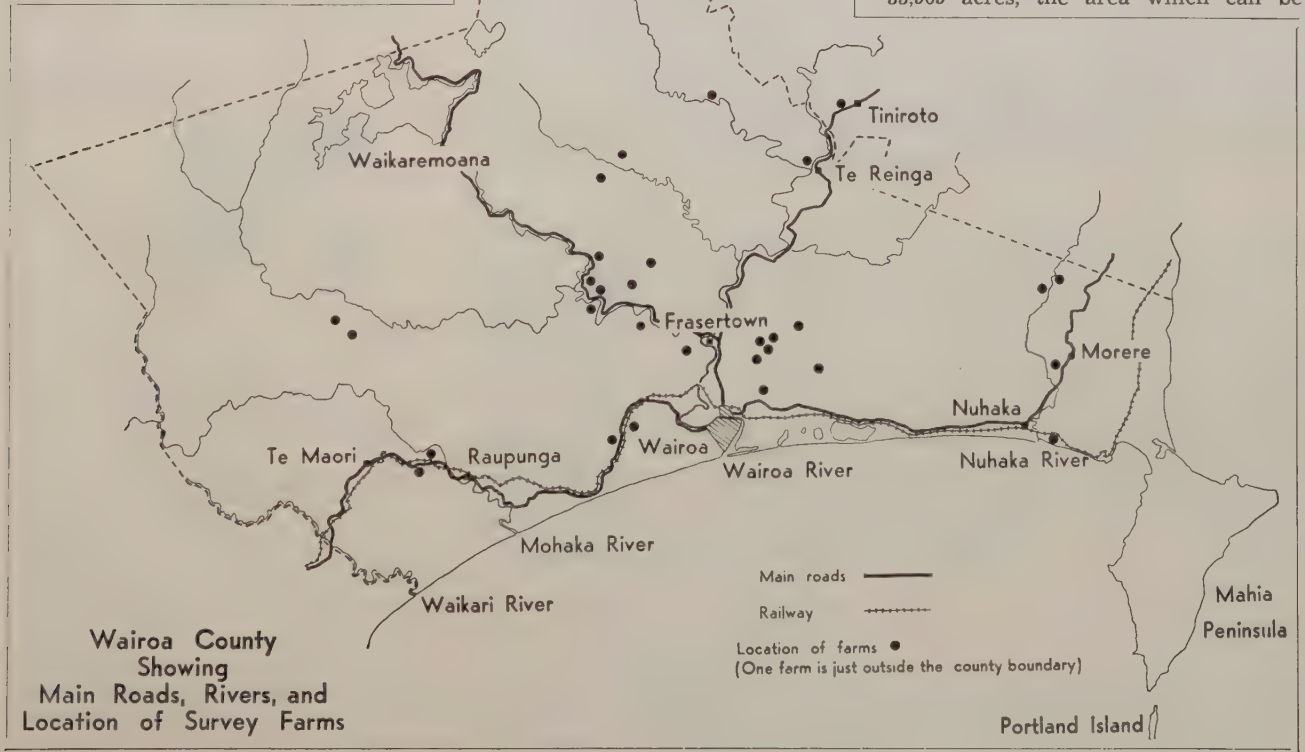
* Includes 10,000 dairy cows in milk.

2. **Relationship of supplementary crops to stock fattening and the possibilities of fodder crop production:** The area of summer and early-autumn supplementary crops is small, approximately 1300 acres, of which 700 is in rape. With a fattening capacity of approximately 20 lambs per acre on rape it means that about 13,000 lambs are fattened on this crop each year. The main reasons for growing small acreages of lamb-fattening crops are:—

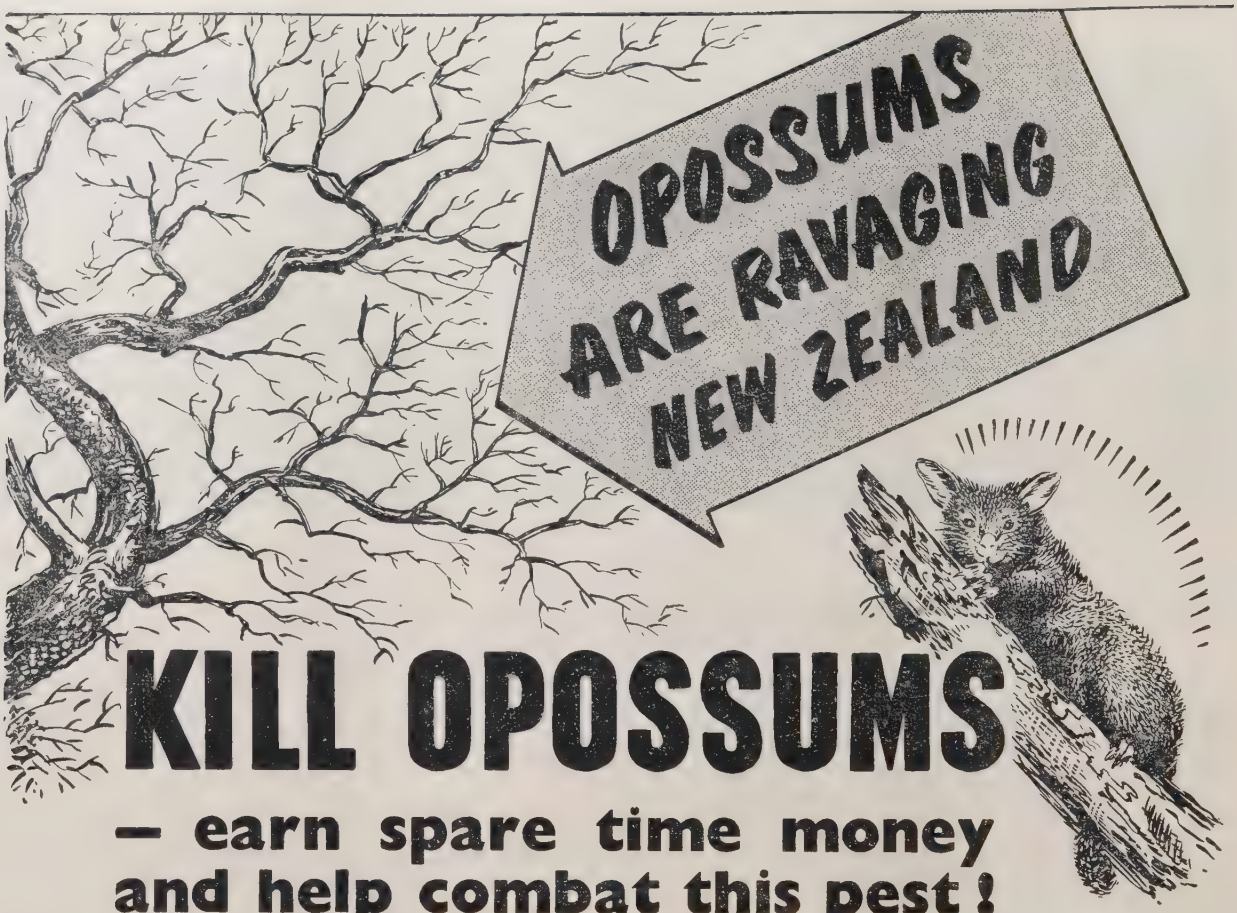
(a) Rape crops are uncertain in the area owing to the relatively high rainfall, which precludes ripening of the crop.

(b) Most of the flat areas and easy rolling country have been developed and laid down to pastures and the practice is not to resow unless they have reverted. Where reversion has taken place a crop is usually sown before regrassing.

(c) The area of land on sheep farms which can be ploughed or disced is small. For 29 farms included in the survey, which have a total area of 33,909 acres, the area which can be



Wairoa County
Showing
Main Roads, Rivers, and
Location of Survey Farms



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Full details of the scheme are presented in a pamphlet which you can obtain by calling at or writing the following offices: Lands & Survey Dept., N.Z. Forest Service, City Councils, County Councils, Catchment Boards, Acclimatization Societies, Opossum Bounty Officer and local offices of Internal Affairs Department.

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Issued by the Wildlife Division, Internal Affairs Department.

ploughed or disced is 5050 acres or 15 per cent. of the total area. Nearly 50 per cent. of the farms have less than 10 per cent. of land which can be disced or ploughed. Details of the area which can be ploughed or disced were not obtained for one farm.

TABLE 5—PERCENTAGE OF AREA OF FARMS PLOUGHABLE OR DISCABLE AND NUMBER OF FARMS IN EACH PERCENTAGE RANGE

Percentage	No. of farms
0 and under 10	14
10 and under 20	7
20 and under 30	5
30 and under 40	2
40 and over	1
Total	29

3. **The importance and possibility of pasture improvement by topdressing and oversowing on hill country or by renewal on ploughable land:** There are approximately 165,000 lambs surplus each year in the county to be sold as stores or to be fattened after requirements for flock maintenance and retention of wether lambs have been met.

Of the 33,000 acres of flat land in the county about 20,000 acres is run in conjunction with hill-country farms; the remainder of the flat areas (about Wairoa, Frasertown, and Nuhaka) are used mainly for dairying. The flats used for sheep farming produce about 12,000 fat lambs annually, which is a small proportion of the lambs fattened in the county. The decline in the number of fat lambs being raised can be attributed mainly to the deterioration of hill-country pastures.

A comparison was made between the hill-country farmers using a reasonable amount of fertiliser over a period and those using little. To make a comparison the quantity of fertiliser used was assumed to have been applied at the rate of 2cwt. per acre and a computation was made of the proportion of the farms which could be covered with the dressing of 2cwt. per acre.

TABLE 6—PERCENTAGE OF AREAS OF FARMS (IN PASTURE-IMPROVEMENT GROUPS) TOPDRESSED AT 2CWT. PER ACRE IN 1950-51

Percentage	No. of farms	
	Good group	Poor group
0 and under 10	3	8
10 and under 20	3	6
20 and under 30	1	1
30 and under 40	3	—
40 and under 50	2	—
50 and under 60	1	—
60 and over	2	—
Total	15	15

On 12 of the farms in the good group oversowing of the hill pastures was also done in 1950-51, but it was done on only one farm in the poor group.

At right—Upper: This country has been developed out of fern and scrub into good pastures capable of carrying 3 to 4 ewes per acre. Middle: Hereford bulls on hill-country pastures near Te Reinga. Because of the fairly high rainfall in summer, there is considerable roughage on pastures, and to control it farms must be well stocked with cattle. Lower: Improved land (foreground) and hill faces still in heavy scrub and fern (background).

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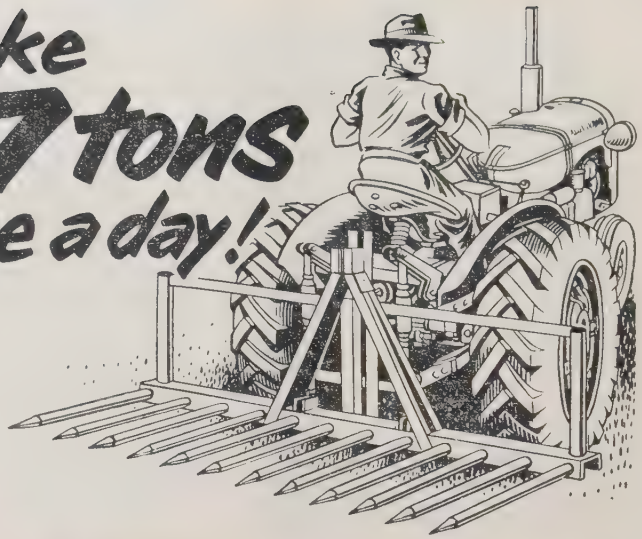

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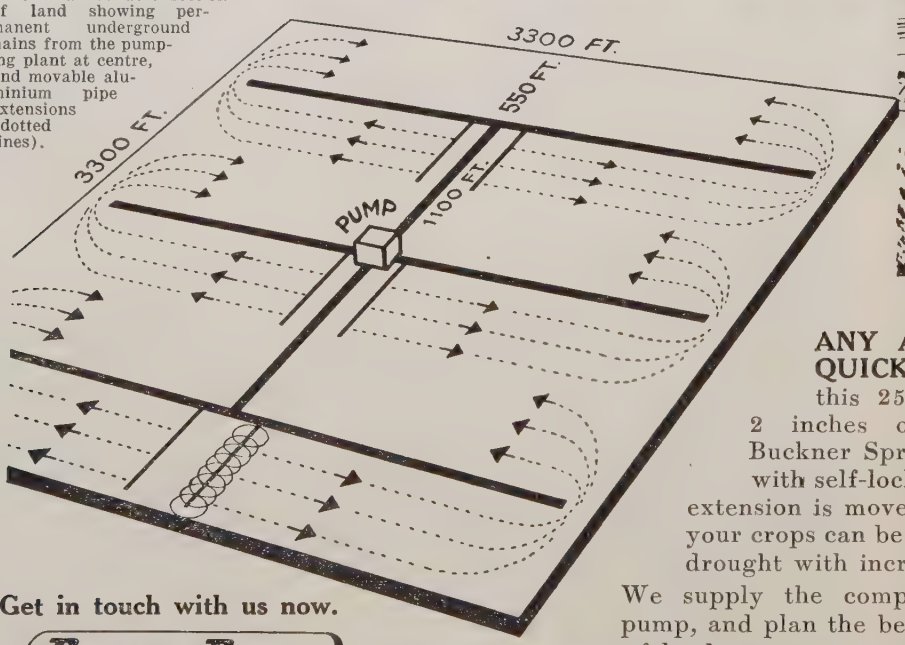

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Coastal country near the mouth of the Mohaka River.

Though the sample is small, the differences in the productivity of the two groups shown in carrying capacity, wool production, and lambing percentages are likely to be due mainly to topdressing and oversowing.

(a) Carrying capacity of farms: For comparison all stock on the farms were converted to a common unit, in this instance the "ewe equivalent". The carrying capacity in ewe equivalents per acre was worked out first over the whole area of each farm and secondly over the total area of each farm less the area in thick scrub on each farm.

If the whole area of each farm is considered, 87 per cent. of the better farms had carrying capacities of over 2 ewe equivalents per acre, and in the poor group 87 per cent. of the farms had carrying capacities of under 2 ewe equivalents per acre.

(b) Wool production: This was computed on the basis of production per 100 acres and per ewe equivalent.

TABLE 8—WOOL PRODUCTION PER 100 ACRES ON FARMS IN EACH PASTURE-IMPROVEMENT GROUP

Production per 100 acres lb.	No. of farms	
	Good group	Poor group
Under 500	—	—
500 and under 1000 ..	—	6
1000 and under 1500 ..	2	9
1500 and under 2000 ..	5	—
2000 and under 2500 ..	3	—
2500 and over	1	—
Total	11	15

The table is not complete, as the wool-clip weights were not available for 4 of the good farms. However, it shows that whereas all the poor farms produced less than 15001b. of wool per

TABLE 7—CARRYING CAPACITY IN EWE EQUIVALENTS PER ACRE IN EACH PASTURE-IMPROVEMENT GROUP

Ewe equivalents per acre	Over whole farm		Over whole farm less area in thick scrub	
	Good group	Poor group	Good group	Poor group
Under 1	—	2	—	—
1 and under 1.25	—	2	—	1
1.25 and under 1.5	—	3	—	—
1.5 and under 1.75	1	3	—	5
1.75 and under 2	1	3	1	6
2 and under 2.25	4	1	3	2
2.25 and under 2.5	6	1	7	1
2.5 and under 2.75	1	—	1	—
2.75 and under 3	—	—	1	—
Over 3	2	—	2	—
Total	15	15	15	15

Below—The Raupunga flats and the Mohaka River gorge. The total area of flat land in Wairoa County is about 33,000 acres.

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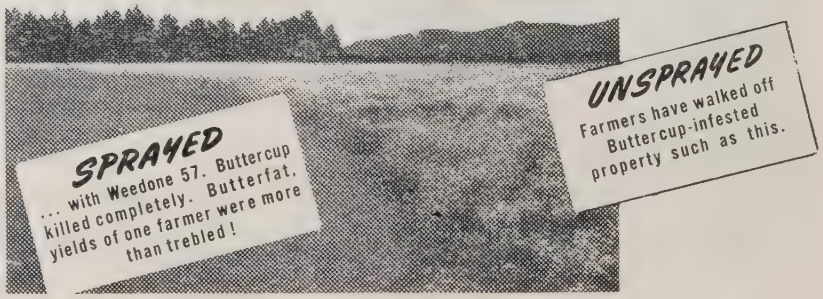
SPRAYED
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Several landing strips have been formed in Wairoa County to facilitate aerial sowing and topdressing. This strip is on a farm near Tiniroto where considerable development has been done.

100 acres at least 60 per cent. of the good farms produced in excess of this figure.

TABLE 9—WEIGHT OF WOOL PER EWE EQUIVALENT ON FARMS IN EACH PASTURE-IMPROVEMENT GROUP

Weight per ewe equivalent lb.	No. of farms Good group	Poor group
4 and under 4.5 ..	—	1
4.5 and under 5 ..	—	3
5 and under 5.5 ..	1	2
5.5 and under 6 ..	2	3
6 and under 6.5 ..	1	—
6.5 and under 7 ..	2	2
7 and under 7.5 ..	3	4
7.5 and under 8 ..	1	—
8 and over	1	—
Total	11	15

Sixty per cent. of the poor farms have a wool weight per ewe equivalent of less than 6lb. and at least 70 per cent. of the good farms have a wool weight per ewe equivalent of more than 6lb.

(c) Lambing percentages: Information about lambing percentages was not available from all farms.

TABLE 10—LAMBING PERCENTAGES ON FARMS IN EACH PASTURE-IMPROVEMENT GROUP

Percentages	No. of farms Good group	Poor group
75 and under 80 ..	—	3
80 and under 85 ..	—	2
85 and under 90 ..	2	2
90 and under 95 ..	3	3
95 and under 100 ..	4	—
100 and over	3	—
Total	12	10

The table indicates that most of the good farms have a lambing percentage of over 90 per cent. and on the poor farms the majority have a percentage less than this figure.

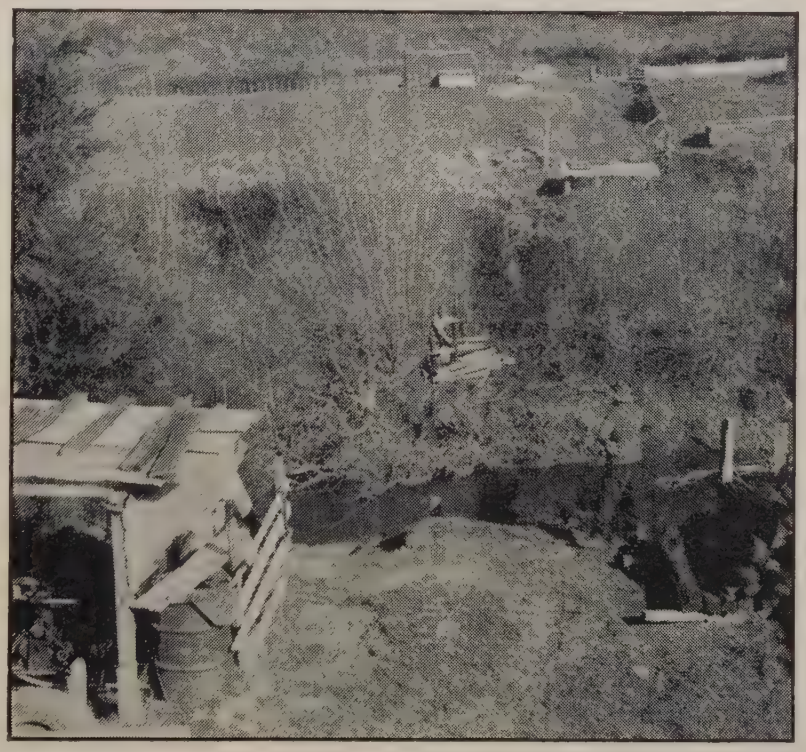
Details of results achieved on two hill-country farms by a vigorous development programme follow:—

Farm A: This farm is 440 acres, of which 120 are flat land. The hill country has been oversown with white and subterranean clover and half of it is topdressed each year. Thirteen years ago, when no topdressing or oversowing was done, the farm carried 500 sheep and in 1950-51 it carried 700 ewes, 160 ewe hoggets, 30 wethers, 20 rams, and 90 cattle. Table 11 sets out the salient features in 1937-38 and again in 1950-51.

Because of adequate and well-distributed rainfall over much of Wairoa County, oversowing of white

TABLE 11—COMPARISON OF RESULTS ON FARM OF 440 ACRES IN WAIROA COUNTY

	1937-38	1950-51
Lambing percentage ..	90	105
Percentage of lambs fattened off mother .	20	45 to 55
Average weight of wool per ewe	8.5lb.	10.2lb.
Percentage of farm topdressed at rate of 2cwt. superphosphate per acre	Nil	50



Difficult access is a problem on a number of Wairoa County farms. This cableway is used by a farmer to bring in all his supplies and to take out sheep and other produce over the Ruakituri River.

[*V. C. Browne photo.*

The town of Wairoa, near the mouth of the Wairoa River, is the chief distributing centre for the county. The freezing works, which provides seasonal employment for a considerable number of workers, is in the middle distance at right. The main area of flat land is near the Borough of Wairoa. Dairy farming and fat-lamb raising are features of farming on this flat land.

clover is usually successful there and results in a quick build-up of pastures if adequate maintenance topdressing is done.

Farm B: This property of 1700 acres north of Te Reinga is surrounded by hundreds of acres of neglected and abandoned scrub land. Two brothers began development 11 years ago by ploughing wherever possible with a hillside plough, by cutting the scrub, and, after burning, by oversowing with white and subterranean clover. Each year over the past 7 years half of the improved area has been topdressed. So far 600 acres of scattered scrub has been ploughed and 700 acres of scattered and thick scrub cut by hand; 300 acres remains to be cut. When development began the property carried 1750 sheep, of which 1200 were ewes, and 180 head of cattle. In 1950-51, 1920 ewes, 950 ewe hoggets, 70 other sheep, and 280 cattle were carried. The average wool clip per head has increased from 8lb. to 10.25lb. No crops are grown to fatten lambs, as they are fattened on grass. Previously it was impossible to fatten cattle on the farm, but since improved pastures have been established 90 to 100 bullocks are sent away fat each year.

4. **Farm management and/or other factors in relation to fat stock production:** Manuka infestation is widespread over the whole county and of the total area of the farms included in the survey 16 per cent. was heavily infested with scrub and bracken fern, etc., and observations support the view that at least this proportion of the farmable hill country in the county is infested. Abandonment of many thousand acres has followed this infestation. Large areas of manuka in the county have been attacked by the manuka blight, and blackened areas as a result of the blight are common.

There is a suspected deficiency of cobalt over much of the county, but sufficient data are not available to draw any conclusion.

Owing to the fairly high rainfall during summer there is considerable roughage on pastures and it is essential for farms to be well stocked with cattle to control it. The county is reasonably well watered and the construction of dams to provide water for cattle over summer is not as necessary as in Hawkes Bay and Wairarapa.

TABLE 12—CATTLE PER 100 ACRES ON FARMS IN EACH PASTURE-IMPROVEMENT GROUP

Cattle per 100 acres	Good group	Poor group
0 and under 5 ..	—	—
5 and under 10 ..	—	1
10 and under 15 ..	1	5
15 and under 20 ..	4	6
20 and under 25 ..	4	1
25 and under 30 ..	4	2
30 and under 35 ..	1	—
35 and over	1	—
Total	15	15

In the good group more than two-thirds of the farms are carrying over 20 cattle per 100 acres; on the poor group 80 per cent. carry less than 20 head per 100 acres.

Fertiliser Usage

It is evident that the county has not yet been able to exploit the advantages of manurial topdressing. After 1934 and until 1939 a little fertiliser was brought into Wairoa by boats able to cross the river bar. In 1939 Wairoa was joined to Napier by rail, but after the outbreak of war it was not possible to obtain increased supplies of fertiliser for the district.

TABLE 13—ARTIFICIAL FERTILISER DELIVERED TO RAILWAY STATIONS IN WAIROA COUNTY

Year*	Tons	Year*	Tons
1939 ..	1871	1947 ..	2484
1941 ..	5001	1949 ..	5338
1943 ..	1338	1951 ..	10,185
1945 ..	2004		

* Ending 31 March.

The Department of Maori Affairs is developing areas in Wairoa County and uses considerable quantities of fertilisers; the amount being used by individual farmers is not great.

The cost of superphosphate at Wairoa, inclusive of railage from the nearest works, is £12 17s. per ton and, as the rail serves only the coastal areas of the county, many inland farmers have to pay approximately £20 per ton by the time the fertiliser is delivered at the farm. Poor road access to many parts and long road hauls have been among the factors limiting the use of fertiliser.

Conclusions from Survey

Results of the survey may be summarised as follows:—

Farmers who are using superphosphate and/or oversowing are achieving much better results than those using little or no fertiliser.

As a very small percentage of the county area is flat land, any increased production must come from the hill country.

The county has a considerable farming potential; sheep numbers can be increased by approximately 115 per cent. and cattle numbers by approximately 40 per cent.

Approximately 16 per cent. of the hill country suitable for farming is heavily infested with scrub.

There is a suspected cobalt deficiency over much of the county.

As rape as a lamb-fattening crop is uncertain, owing to the relatively high summer rainfall, the suitability of alternative fattening crops such as sweet yellow and blue lupins could be investigated.

Hill-country areas such as Wairoa County are of importance as a source of breeding stock for more intensive farming areas, and the improvement of pastures on a considerable portion of the hill country of the county will mean the production of a greater number of fat stock. One of the keys to the problem is the use of much greater quantities of fertiliser and oversowing with clovers, but to achieve this a number of physical and economic problems will have to be overcome.

Reference

"Transactions of International Congress of Soil Science Amsterdam 1950", vol 2. "Land Classification, New Zealand", by L. I. Grange and P. W. Smallfield.

Commercial Carnation Culture on Coromandel Peninsula

By C. E. K. FULLER, Horticultural Instructor, Department of Agriculture, Hamilton

COROMANDEL PENINSULA with its bush- and scrub-covered hills and sheltered bays is becoming one of the most popular tourist and holiday resorts in New Zealand, being able to offer scenic beauty swimming fishing and shooting. Coromandel was once one of the wealthiest counties of New Zealand because of its vast stands of kauri and the presence of gold reefs, but the value of its natural resources has slowly declined. Dairy farming is now carried out in the fertile pockets, with sheep farming on the more easily managed hill country. Recently, however, the possibility of using some of the more favourable land for horticultural production has been tried by one energetic settler, and progress to date indicates what may be achieved, despite the many problems that had to be overcome.

THE property which is the subject of this article was purchased for growing tree tomatoes and other sub-tropical fruits on a commercial scale, but because of lack of adequate labour this would have been uneconomic. It had however been noticed that carnations growing in the home garden flowered profusely, in particular the variety Rose Clove, which carried blooms the year round.

Sufficient stocks of this variety were built up and a small trial block planted out and worked part-time. So successful was this venture that plantings were increased and a nursery business created.

Situation and Property

Situated on Cook's Bay, near Whitianga, Mercury Bay, the property originally consisted of 84 acres, but further additions have been made recently. Of the total area three-fifths is suitable for cultivation, and of this about 20 acres is in use annually for cut-flower production.

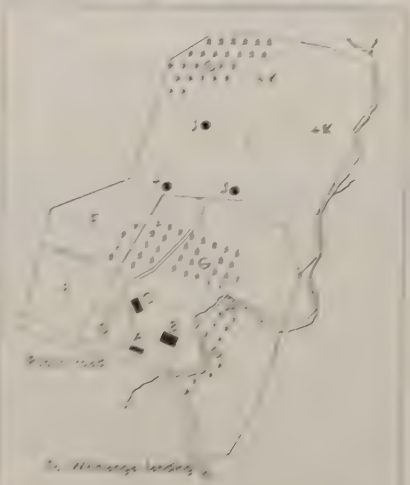
The property has a northerly aspect, rising fairly sharply from the roadside and levelling off into an undulating plateau several hundred feet above sea level. It is here that the carnations are grown.

Access to the area has been gained by bulldozing a road up the hillside. As the surrounding land here is in the main unsuitable for cultivation, pine trees and suitable flowering shrubs are being planted.

From almost any point on the property there is an uninterrupted view of Mercury Bay. On the property is a waterfall, from which the water for both household and propagating purposes is obtained.

Land Development

The area for cultivation was divided into a series of blocks, enabling crop rotation to be practised, and allowing development of the land as required. Breaking in was then begun. It entailed the destruction of the original plant covering of manuka, bracken



Layout of nurseries. A—Main packing shed. B—House. C—Implement and manure shed. D—Propagating frames. E—Cow paddock. F—Orchard. G—Areas to be planted in pines and ornamental shrubs. H—Waterfall. I—Main growing area. J—Stripping sheds. K—Sites for proposed stripping sheds. L—Stream.

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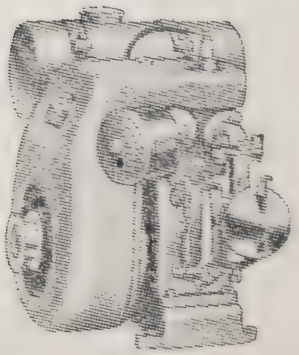

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fern. tauhinau (*Pomaderis phylicaefolia*), and *Hakea acicularis*. Firing of the manuka and hakea after cutting was found to be the most satisfactory method, giant discing being used to destroy the remaining scrub growth. The land was then allowed to fallow for 6 months.

Soil Type and Management

Known as a Pukenamu clay loam and loam, the soil consists of a 4in. creamy brown to dark grey clay loam to loam, on a cream-brown granular clay, and although free draining, it does not tend to dry out excessively during wet weather. Experience has taught however, that it requires special initial management for carnation culture. The dense root growth formed by the natural vegetation must first be broken by discs and allowed to fallow, for if the roots are ploughed under, they form an impervious layer which will not readily decompose, and water flowing between this and the subsoil in winter causes a form of sheet erosion to take place on the steeper slopes. Secondly the land is best left fallow for at least 6 months to allow the readjustment of the carbon : nitrogen ratio of the soil. Good initial plant growth cannot be expected if this is neglected.

Soil tests have shown that the soil requires lime applications varying from 1 to 2 tons per acre, but experience has shown that this is best applied on removal of the first crop of carnations planted. If it is applied after breaking in, or before the carnations are planted, plant growth is weak.

After fallowing, the land is worked into a condition suitable for planting. Equal parts of basic slag, African phosphate, and blood and bone are used at 4cwt. per acre as a base dressing. Side dressings of basic slag and African phosphate at 2cwt. per acre are made during the growing season as required.

Carnations of the variety Rose Clove in bloom.

Culture

Cuttings of plants to be used for cut-flower production are taken in July and early August, placed in open propagating frames, rooted, and lined out in mid-November.

Cuttings of carnation collections for rooted-plant sales in May and June are taken at the end of December and beginning of January. All cuttings are "stopped" regularly while in the frames, thereby encouraging bushy plants.

All planting is done by hand, about 6000 plants being lined out per acre. A total of 75,000 plants was lined out in the 1952 season, 63,000 being the variety Rose Clove, and the remainder consisting of variety collections.

Disbudding is carried out regularly, all heads being reduced to a single bloom. The peak of this operation is reached in November and only then is outside labour employed.

Cultivation

Throughout their growing period the plants receive inter-row and inter-plant cultivation. Powered tools are

The nursery, developed out of scrub.

During May, 7 months after lining out, picking is started and is continued until May of the next year, when the block is ploughed in and picking is started on an area blooming for the first time.

used and it has been found necessary to design and fit cover plates over the motors of the machines used to minimise plant damage.

The machines are of the rotary cultivator type, being of 6 and 2 horsepower. This type of machine has been found to be preferable to wheel types of powered hand-operated cultivators because the light soil on the steeper slopes offers little or no grip and wheel-type machines and attached implements therefore tend to side-slip.

The same problem occurred with heavy tractors, the light soil of the broken-in areas gathering in front of the tractor wheels and implements (discs), resulting in wheel and side skid. Contractors in the past have carried out this work, but the property has now become large enough to employ a tractor fully. In view of the experience gained with the smaller machines, it is hoped that the problem will be overcome by the purchase of a tractor which is able to be fitted with a hydraulically controlled, rotary-type cultivator, this implement not only becoming part of the tractor, but also adding extra traction and grip through the turning blade.

Picking

Picking is started during May, 7 months after lining out, and is continued until May of the next year, after which the block is ploughed in and picking is started on an area blooming for the first time.

The picked blooms are first taken to the stripping sheds, placed at strategic points, and all unnecessary foliage is removed. The blooms are then placed in containers and taken to the main packing shed, where they are graded, counted into bundles containing 3 dozen flower heads, tied, and placed in water overnight, the stalks being immersed as deep as is practical without danger to the blooms. The troughs used for this purpose are constructed of galvanised-iron sheeting and are 8ft. x 18in. x 14in.

Early the next morning the blooms are removed from the troughs and packed for delivery, any excess moisture being drained off first.

Marketing

Two types of heavy corrugated cardboard containers are used for marketing, one 3ft. x 12in. x 7in. holding 15 to 21 dozen blooms, the other 2ft. x 10in. x 5in. holding 6 to 9 dozen blooms. All containers are lined with coloured waxed paper before the blooms are packed. During the year, 400 dozen blooms are marketed each week.

Waterfall, from which water for household and propagating purposes is obtained.

The nurseries, over the few years that they have been operating, have developed their own marketing system by guaranteeing a supply of cut flowers the year round at summer and winter prices.

The flowers are brought to Hamilton by private transport twice weekly for distribution to points south to Gore and north to Auckland, rail, road, and air services being utilised.

Shelter

Quick, efficient, temporary shelter has been obtained by "spot sowing" of brush wattle (*Albizzia lopantha*) along exposed positions, while partial shelter is afforded by scrub on the surrounding unbroken land.

Disease Control

Disease control is not yet a problem. Snails become a nuisance when the young plants are in the propagating frames, and caterpillars cause minor damage to plants in the field. The latter are readily controlled by applications of arsenate of lead or D.D.T., the spraying being carried out, when necessary, after picking.

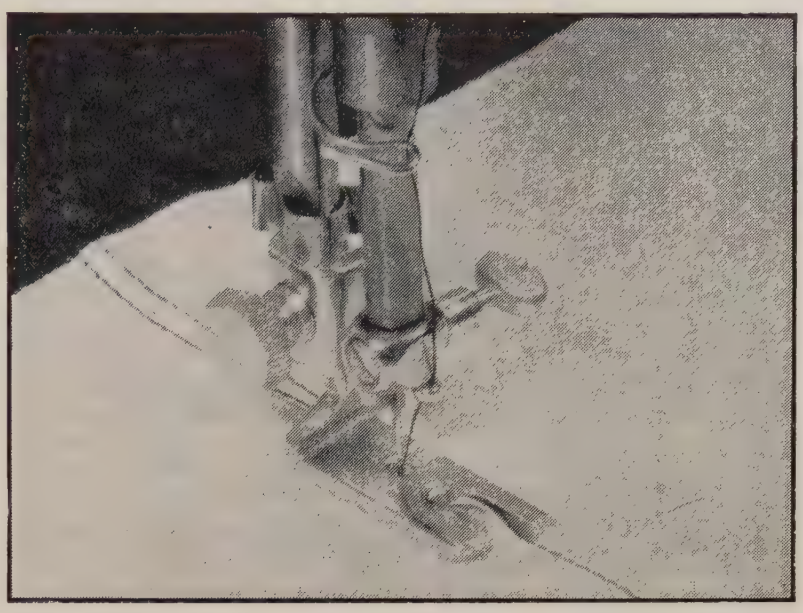
Success of Venture

This venture of commercial flower culture in a remote district where it had not previously been tried may be claimed to be an outstanding success. All difficulties have so far been overcome, but only by the hard work of the proprietor and his family.

Many improvements are planned for the future, but even at present this profitable enterprise is an outstanding example of what may be accomplished on country which is apparently unsuitable.

Sewing Machine Attachments

MOST sewing machines are sold with a set of special attachments to simplify such work as hemming, tucking, and binding, and some may be adjusted to do other work. Though the purchaser is usually provided with an instruction book describing these labour-saving gadgets, few people get much advantage from them because of a reluctance to try them out. In this article by Helen Paine, Field Officer in Rural Sociology, Department of Agriculture, Wellington, the use of the more ordinary attachments that are included with most machines and the application these attachments can have in dressmaking and household sewing are described.



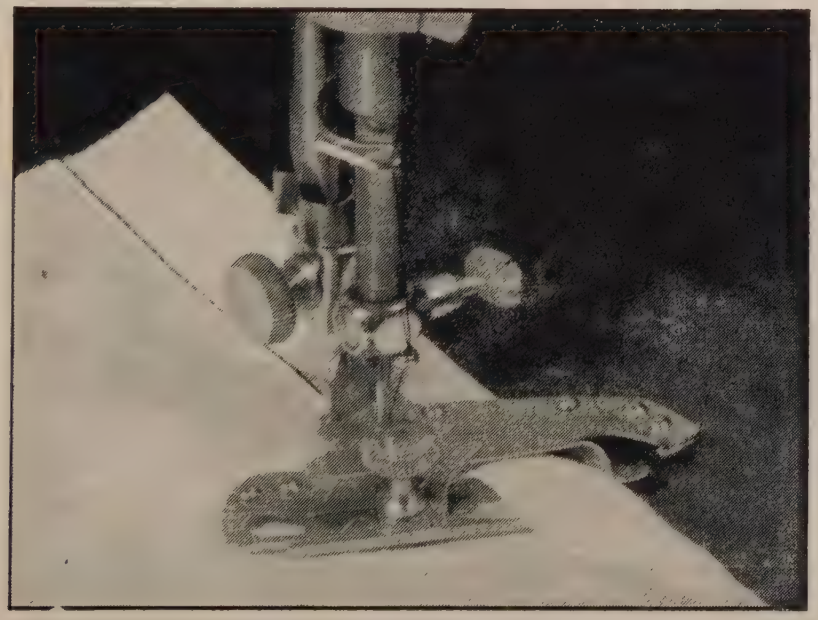
The hemmer making a flat fell seam.

EACH sewing machine attachment is designed to speed up an operation that would otherwise have to be done in two or more steps or by hand. Often after one trial an attachment such as the hemmer is put away in its box with the comment: "It is quicker to do the job by hand", or the feller is discarded because "the seam was more untidy than those done by the usual method". However, to try out the attachments once is not enough; skill is required to use all but the simplest, and though this comes quickly, it is necessary to practise on a scrap of material at least twice before using a new gadget. When sufficient skill has been attained it will be found that time is saved and that a neat finish is obtained very easily by using the attachments carefully.

Most attachments are fixed to the machine in place of the presser foot. The needle is first raised, the presser foot is unscrewed, and the attachment is screwed on in its place. The balance wheel is then turned slowly to make sure that the needle goes through the needle hole and does not touch the side of the attachment.

The Foot Hemmer

The hemmer is a small attachment about the size of the presser foot. It is a plate which fits behind and in front of the needle hole and is solid except for the small scroll at the mouth of the hemmer. The material is fed into this scroll and is turned under twice before it reaches the needle hole, where it is caught with the machine stitch. When the hemmer is to be used the material must first be folded by hand as if for a narrow ($\frac{1}{4}$in.) hem for about an inch, and then with the hemmer foot raised the material is drawn through the scroll with the hem on the right and the material on the left of the worker. When the portion of the hem that has been folded by hand is under the needle the hemmer foot is lowered and the first few stitches are made very slowly by turning the balance wheel with the hand. With the first few stitches caught, the rest of the material can easily be guided through the hemmer. With the thumb and finger of the right hand the material is kept drawn over the top of the hemmer while the left hand keeps the bulk of the material in place. To get an even hem the scroll of the hemmer must be kept just full of material. If the material slides to the right of the hemmer, the hem will be too narrow, and the material in the right hand should be drawn further over the hemmer. If the material is drawn too far over the hemmer in the opposite direction, the hem will be too wide.



The adjustable hemmer in use.

The hemming attachment is particularly useful for hemming blouses, the skirts of long dresses, tea towels, the edges of sheets if they have been turned sides to middle, and in fact for any edge where an invisible hem is not required. It works particularly well with fine materials and is excellent for hemming underwear, and has a special use for those who like to sew the edges of their underwear by hand. With the sewer using the hemmer and largest stitch on the machine, the material is guided through and caught by what amounts to a tacking stitch.

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Lace can then be whipped on to the edge or a shell stitch can be worked much more quickly than when the hem has to be rolled and whipped or turned and sewn at the same time. The tacking stitch can then be removed quite easily.

Uses of the Hemmer

Sewing on lace: A hem is folded by hand for 1in. and fed into the hemmer as previously described. When the first few stitches have been made the hemmer foot is raised and the straight edge of the lace inserted so that it lies under the heel of the hemmer and goes through the slot in the side of the hemmer and over the scroll. The hem has to be guided into the attachment as described before, but the lace also has to be guided by the thumb and first finger of the right hand. This usually requires a little practice before it can be done perfectly. The hemmer can be used for attaching insertion and edging laces, and can also be used with a very large tacking stitch which holds the hem and the lace in position for whipping, and which can then be removed. This is much easier than attempting to roll, whip, and attach the lace in one process.

Sewing a flat fell seam: The two pieces of cloth to be joined with a flat fell seam are laid with their right sides facing; the lower piece should protrude about ¼in. The first seam is sewn with the ordinary presser foot, or with the hemmer foot used as a presser foot, the front projections acting as a stitching guide. The first seam should be close to the edge of the upper piece of material, but care should be taken that it is not so close that the seam gives way under strain. The first seam is then opened out so that the two raw edges stand up from the material. The top edge is then folded by hand for an inch and eased into the hemmer until it can be caught under the needle. The edges are then guided slowly through the hemmer as described before.

The Feller

The feller is included with some machines especially for sewing a flat fell seam. It is similar to the hemmer, except that it has no scroll and therefore turns in the material once only. As with the hemmer the lap seam is sewn in two operations as follows:—

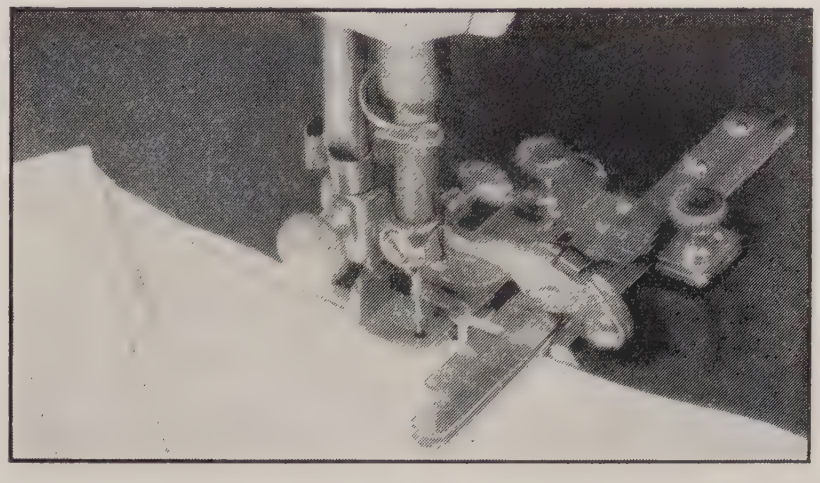
1. The pieces of fabric to be joined are placed on top of each other with the lower piece projecting slightly. Both pieces are guided into the feller so that they are turned down at the same time, care being taken that the same width of material always enters the feller.

2. When the two pieces of material are unfolded and laid flat the join stands up like a small pleat. This pleat is guided through the feller in the same direction as before so that the raw edge is turned in and the hem sewn down.

Equipment for Wide Hems

Some machines are provided with a special series of hemmers similar to that described but specialised for sewing wider hems. They are used in the same way as the narrow hemmer. Other makes of machines are provided with an adjustable hemmer that will sew any width up to 1in. The adjustable hemmer is basically the same as the foot hemmer. A scroll attached to the foot turns the hem in while a projection to the right of the foot adjusts the width of the hem. A gauge marked in sixteenths of an inch and numbered in eighths of an inch from 1 to 8 is set by loosening a thumb screw and sliding the attached pointer to the required mark on the gauge. For instance, for a hem ½in. wide the pointer is set to 4. The adjustable hemmer replaces the presser foot. The hem is turned under for about an inch and inserted into the hemmer under the gauge and through the scroll. The material is then slid backward and forward until the hem is formed for some distance, the pressure bar and needle are lowered, and sewing is done slowly, the material being guided into the attachment.

For a hem wider than 1in. the adjustable hemmer is still useful for turning in the raw edge, though the main crease must be made by hand. The thumb screw is loosened and the gauge pulled to the right as far as it will go and swung round to the left to expose the scroll and projection. The screw is then tightened. The edge to be turned under is inserted into the scroll and will be stitched by the machine, but the crease for the hem must be kept evenly turned under as the machine sews.



The tucker keeps each tuck the same width and marks the position of the next tuck.

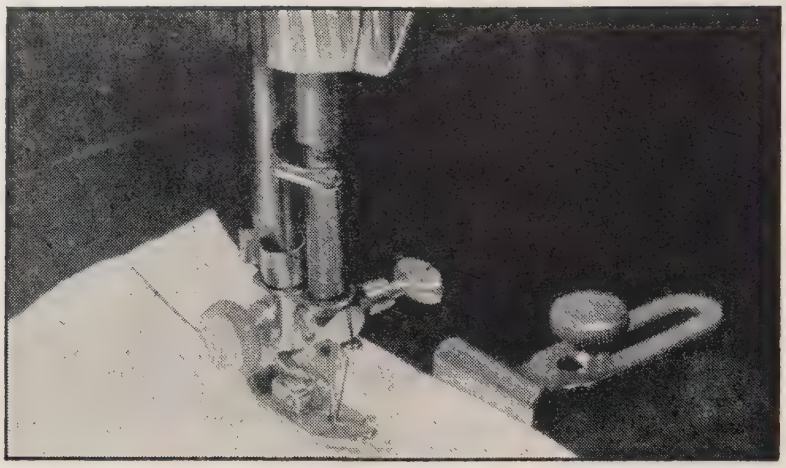
The Tucker

The tucker replaces the presser foot. Two gauges extend to the right of its foot. The small one close to the needle hole is the tuck scale, which adjusts the width of the tuck. It is set by loosening the screw at the back and sliding the guide on the scale to the required mark. The scale is marked in sixteenths of an inch and numbered in eighths from 1 to 8 over 1in. For a tuck ¼in. wide the guide is set at 2. The scale keeps the tuck uniform in width. The large gauge in front of the attachment is the space scale, which adjusts the distance between the tucks. It is marked in eighths of an inch and numbered in quarters from 1 to 3 over 2in. The space required between the tucks is adjusted by loosening the front thumb screw and moving the space scale until the number desired is directly in line with the centre of the needle hole. A marking lever above the two gauges is pressed down as the machine sews and brings a groove at the end of the space scale in contact with a spur on the blade below it. When these are pressed together a mark is made on the material which indicates where the fold is to be made for the next tuck.

To adjust the spaces between the tucks, the tuck scale is first set and the space scale moved to the same number; this will give tucks with no space between. For instance, with the tuck guide at 1 and the space guide at 1, tucks of ⅛in. with no space between them will be made. With both guides at 4, tucks of ½in. with no space between them will be formed.

For obtaining a required space between tucks the space guide is moved the required distance after it has been set at the same number as the tuck guide. For instance, for tucks ¼in. wide with ¼in. space between them both scales are set at 2 and then the space scale is moved ¼in. to 3. For ½in. spaces the scale would be moved to 4.

To make the first tuck the material is creased for its whole length by hand. The tuck is then inserted into the attachment so that the material goes under the space scale and between the blades of the tuck guide. When the beginning of the tuck is under the needle hole the presser bar and the needle are lowered and sewing is begun, the material being guided through the attachment. The position of the next tuck is marked by the spur and groove on the space scale, and the material has only to be creased and inserted as before. The tucker is most satisfactory when it is used on fine linens, cottons, and silks; these materials crease easily and the space guide mark can be readily followed when tucks are being folded. Materials such as wools or wool and cotton mixtures or any crease-resisting materials are not marked. Though the tuck guide is still useful for keeping the tucks in these materials even in width, the spacing of the tucks must be measured and the material creased by hand. The tucker will be found to be particularly useful for making tailored blouses and fine tucks on babies' dresses. Care must be



A small but useful attachment provided with most machines is the sewing guide. Screwed into the machine as shown it acts as a guide to keep seams an even width, and is useful for keeping lines of stitching straight.

taken to see that only fine cotton and fine needles are used, as these are necessary for successful tucking.

The Ruffler

The ruffler has a complicated appearance, but is really very easy to use. It can be used for making even gathers for any sort of frill, and also for making small, even pleats. It replaces the presser foot, but when it is being screwed on care must be taken that the forked arm which projects at the top is placed astride the needle clamp. A lever at the back of this projection has two slots marked 1 and 5. If the projection is placed in the slot marked 1 a full gather is sewn. With the projection in slot 5 the material is gathered into small pleats, which are made every fifth stitch.

At the base of the attachment are two blued blades, serrated at the end. The material is inserted between these, and the serrated teeth push the material in pleats up to the needle. The attachment has guides, and the material is fed through different guides according to the particular operation being carried out. The operations are described in detail below. The fullness of the ruffles is adjusted by the large screw on the top projection, the screw being turned up to lessen the fullness and down to increase it.

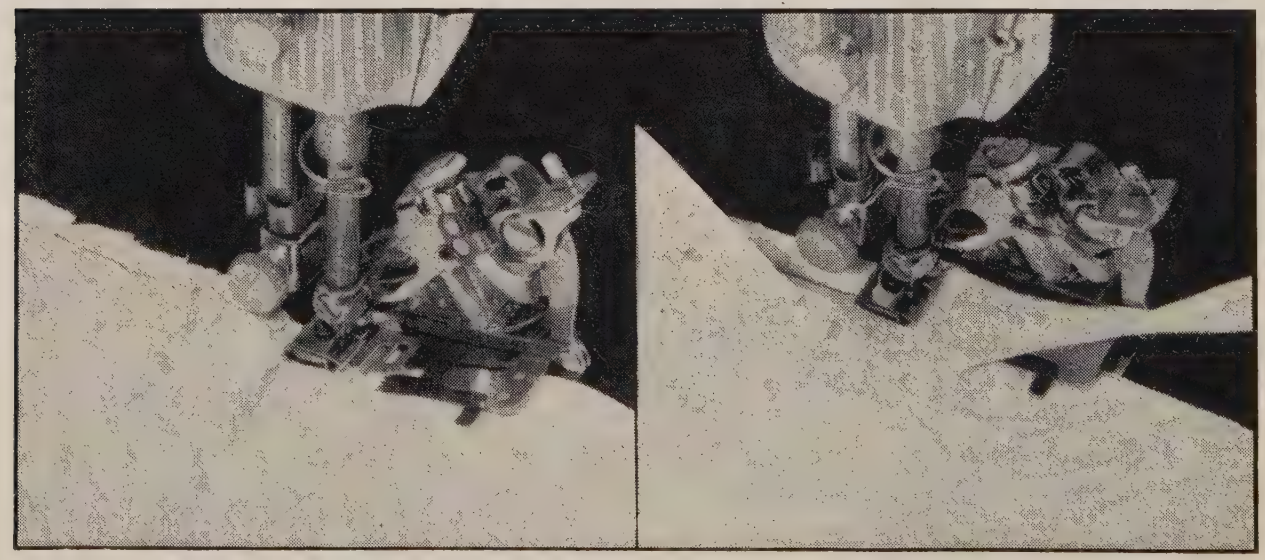
Uses of the Ruffler

Ruffling: The edge of the material to be gathered is inserted between the two blades and under the first projection of the guide at the back. After the presser bar and needle are lowered sewing is begun, the material being cased into the guide at the back.

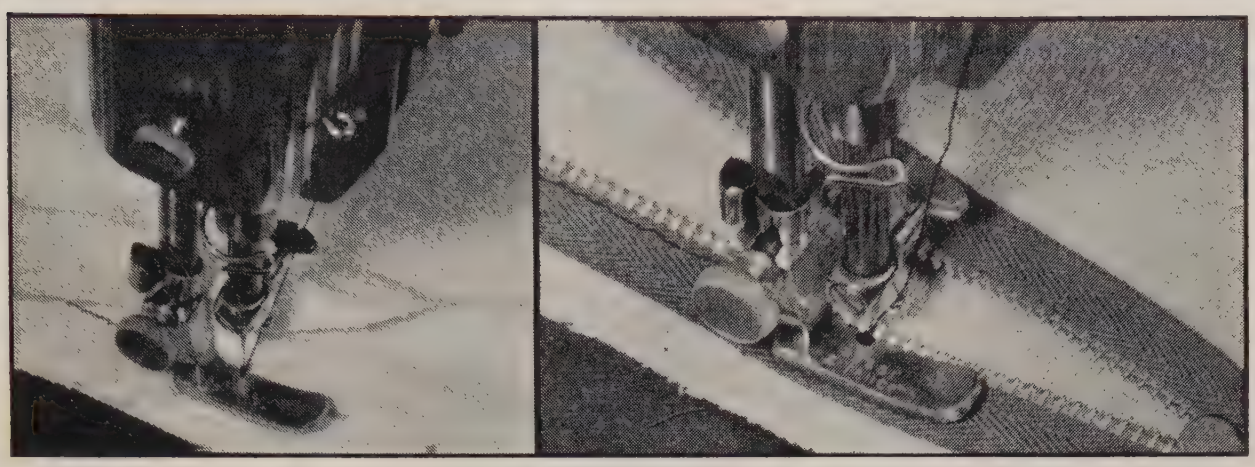
Ruffling and setting material on to a garment in one operation: The material is placed as described for ruffling; the edge of the garment to which the ruffle is to be attached is placed under the bottom blade and brought up with the top piece of material beyond the projection of the guide at the back. The operation is continued as described for ruffling, both pieces of material being fed carefully into the machine.

Adding a facing to a ruffle when the ruffle is sewn on to a garment: The piece of material to be ruffled and the garment on to which the ruffle is to be sewn are placed in the attachment as described for ruffling and setting. The facing material is placed above both blades and under the projection of the front guide. The three pieces of material are then guided gently through the attachment. For pleating, the material is placed in the same position as for ruffling and the lever is set at 5. A long stitch will make the pleats further apart, and, with the screw adjusted, pleats of up to ½in. are formed. If spaces are required between the pleats, lift the lever and place it on top of the projection at the position marked with a star. The ruffler will then stitch plain stitching until the lever is moved.

The ruffling attachment is particularly useful for sewing anything that requires even gathers. Frills round petticoats may be sewn on and faced in one operation. Border frills for bedspreads, eiderdowns, and curtains are easy to sew with this attachment, and are much more even than those gathered by hand. The degree of fullness required can be controlled by the adjusting screw and the length of stitch. A good idea is to try out the fullness on an extra piece of material and adjust the attachment properly before working on the cloth.



Uses of the ruffler. Left—Placing of the material in the attachment. The material at the left has been ruffled once in five stitches, and that which has just passed through the blades has been ruffled with every stitch. Right—Sewing ruffled lace on to a piece of cloth and binding it at the same time.



The piping foot. Left—Sewing close to a piping cord. Right—Sewing close to a slide fastener.

The Piping Foot

The piping foot is similar to the presser foot, but has only one prong side bar, which means that with this equipment it is possible to stitch very close to cord or a slide fastener or any other raised surface. It is the simplest of all attachments to use. It replaces the presser foot, and sewing proceeds as usual. Care must be taken that the needle does not get too close to the cord or the metal in a slide fastener, as these will break the needle.

The Binder

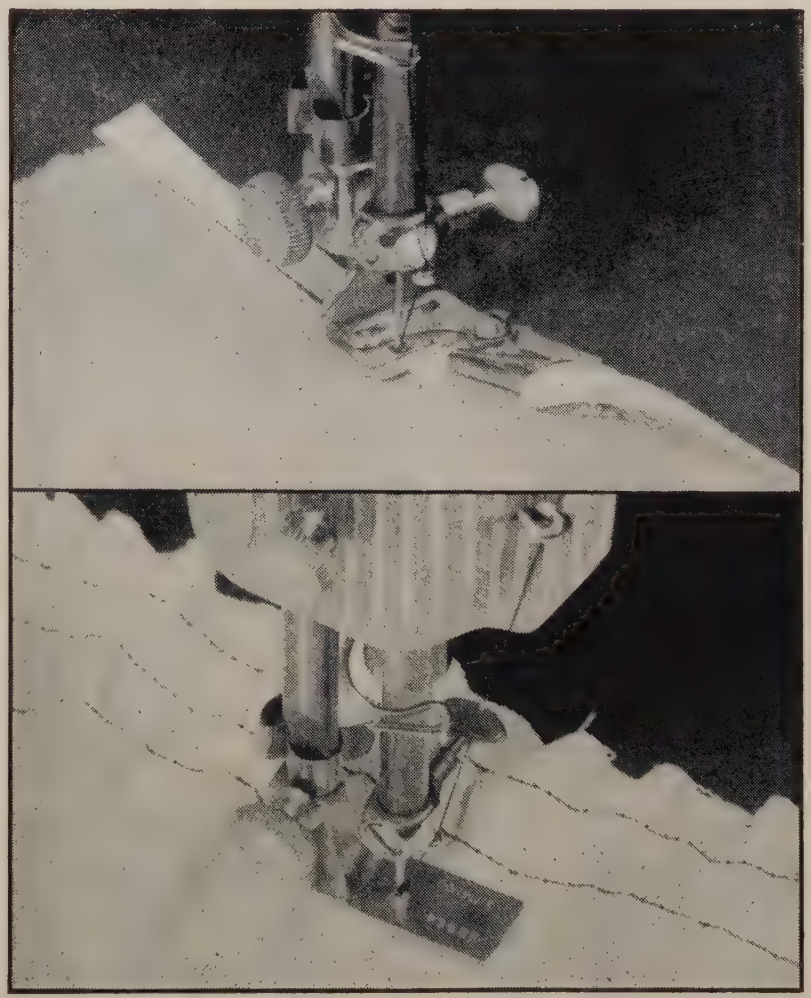
The attachment known as the binder is a standard provision with most machines. The material is fed through a double scroll which turns in both edges of the binding material and at the same time folds it in half. The binding material, which should be just 1in. wide, is folded by hand for a short distance. It should be folded in half and cut to a point which is passed through the scroll and drawn under the needle. The material to be bound is then placed between the upper and lower scrolls of the binder and under the needle. Care must be taken to keep the material in position so that the edge is always caught by the binding; at the same time the binding must be fed into the attachment evenly. This requires a little practice.

The Shirrer

A small foot like the presser foot with the two front prongs joined is called the shirrer; it is especially adapted to stitch material in gathers. The fullness of the gathers can be adjusted by lengthening or shortening the stitch. An attractive effect can be obtained by winding embroidery silk on to the bobbin and stitching the material on the wrong side. The stitch should be practised on a trial piece of material to get the tension and the fullness correctly adjusted.

Attachments for Darning

Many of the machines now on the market have special attachments for darning and embroidery; some models have no special attachment, but provide an easy way of releasing the presser foot from the presser bar to



Upper—The binder in use, showing the binding material and cloth being bound in position in the attachment. Lower—The shirrer gathers material loosely.

disengage the feed. This means that the material can be moved freely by hand and the stitch guided from side to side and backward and forward across the area to be mended or decorated. It is sometimes necessary to use a frame so that the material is kept taut and cannot pucker while being stitched. This is essential for embroidery. For both darning and embroidery the tension of the upper thread should be loose and the cotton should be thinner than would ordinarily be used; otherwise a very thick darn results. Some machines are designed with a free arm projecting so that socks and stockings can be slipped over it and darned.

When household linen is to be darned the special attachment is fitted according to the instructions, which may be different for different machines. The part of the hole farthest away from the worker is placed under the foot of the machine to be darned first. The stitching is started and the cloth is guided from side to side under the foot so that the machine threads are stretched across the hole and gradually cover it. These should be parallel and close together and should extend some way past the hole to strengthen the material, each row being taken different distances into the fabric to prevent the material tearing at the limits of the darn.

When the rows of threads from side to side have covered the hole the material is turned round and the crosswise threads are put in in the same way. The first rows should be in the fabric itself and then the darn should be made very close.

Darning with Wool

Some machines provide a special attachment for darning with wool. A foot that looks like a needle with a loop at the tip replaces the presser foot. The wool is fed through the loop and the rest of the machine is threaded as usual with cotton to match the wool. The same adjustments are made to the machine as for ordinary darning. The sock is drawn over the arm of the machine until the hole is under the needle. The wool is placed in the notch in the darning foot. The hole is then covered with rows of wool by guiding the sock from side to side. The wool is caught at the edges of the hole by the cotton machining and carried across it in rows that are fairly close together. When the hole has been covered one way the wool is broken off and the crosswise threads are put in with the cotton as for ordinary darning. This gives a very strong darn that is not as bulky as if both directions were darned with wool. The threads in the second direction should not be too close together if the darn is to be elastic.

Many other attachments have not been mentioned in this article. Some machines have attachments for sewing invisible hems and for making buttonholes; some of the newer and more expensive models can be adapted to sew with a zig-zag stitch, which is used for many different sorts of embroidery.

A description of the uses of these attachments is beyond the scope of this article, which aims to encourage the home dressmaker to use the attachments provided with her machine and those readily available.

Croquettes, Cromesquis, and Rissoles

CROQUETTES, cromesquis, and rissoles are all essentially the same. They are made from a mixture of cooked foods which have been blended thoroughly, shaped, and fried. Left-over meat and vegetables can be made into one of these and served for lunch, tea, or even breakfast with eggs or bacon or a highly flavoured sauce. Among the sauces most commonly used are tomato for fish, mutton, chicken, and rabbit croquettes, mustard or horse-radish for beef and ham croquettes, and mushroom or onion sauce for vegetable croquettes.

HERE is the basic method for making croquettes, cromesquis, and rissoles; the quantities given make 4 to 6 croquettes:—

- 2 cups of cooked vegetables or minced cooked meat or fish
- 1 small onion, minced
- ½ teaspoon of salt
- Pepper and cayenne to taste
- 1 egg or ¼ cup of milk or thick white sauce

Mix all the ingredients to as soft a mixture as can be handled conveniently. If the mixture is very dry, more milk may be necessary; if it is very wet, breadcrumbs can be added to make it stiffer.

Flour the hands and roll large spoonfuls of the mixture into balls. Then roll them on a floured board and shape them as desired—into patties, cylinders, cones, cutlet shapes, or, in fact, any shape which can be conveniently handled in frying.

Beat an egg with 2 tablespoons of cold water and pour it into a soup plate or enamel pie plate. Roll the croquettes in fine dry breadcrumbs, dip them in the egg and coat them thoroughly, then roll them in the breadcrumbs again; oatmeal or rolled oats may be used instead of breadcrumbs.

If the food is to be deep fried, heat a saucepan of fat. It is at the correct temperature if it will brown a 1in. cube of bread in 40 seconds. Lower the croquettes carefully into the fat two or three at a time and move them about in the fat until they are golden brown. Drain them on crumpled paper in a hot oven until they are to be served.

If the rissoles, croquettes, or cromesquis are to be fried in shallow fat (sauted), melt 1 to 2 tablespoons of fat in a pan and when it starts to smoke put in the rissoles. Fry them until they are golden brown on one side, then turn them and brown the other side. This method is more suitable for patty and cutlet shapes.

Recipes

Any of the following recipes may be prepared by the basic method.

Beef Cromesquis

- 2 cups of minced roast beef
- Pepper and cayenne to taste
- ½ teaspoon of salt
- 1 small onion, minced
- 1 egg

Lamb or Mutton Rissoles

- 2 cups of minced cooked lamb or mutton
- A few leaves of mint, chopped
- Pepper to taste
- 1 small onion, minced
- ½ teaspoon of salt
- 1 egg

Fish Croquettes

- 2 cups of cooked flaked fish
- Juice of ½ lemon
- ½ teaspoon of salt
- Pepper and cayenne to taste
- 1 cup of thick white sauce

Vegetable Croquettes

- 2 cups of mixed cooked vegetables
- 1 small onion, minced
- Parsley if desired
- ¼ cup or less of milk
- ½ teaspoon of salt
- Pepper to taste

Parsnips, carrots, cauliflower, and potato make a good mixture of vegetables, but any others can be used. The amount of milk used depends on the wetness of the vegetable mixture.

Veal and Ham Croquettes

- 1½ cups of minced cooked veal
- ½ cup of minced cooked ham
- 1 egg
- ½ teaspoon of salt
- Pepper and cayenne to taste
- 1 small onion, minced

—NELL MACPHERSON,
Field Officer in Rural Sociology,
Department of Agriculture,
Auckland

[*Sparrow Industrial Pictures Ltd. photo.*

Before being fried rissoles are rolled in egg and breadcrumbs.

Preserving Nutrient Value of Vegetables

PROBABLY the greatest amount of unnecessary waste in the preparation of food takes place in the cooking of vegetables. As much of this waste is invisible, it is hard to realise that vegetables prepared correctly may contain so many more nutrients than those subjected to careless methods. Many people who tend their gardens and grow their vegetables with loving care thoughtlessly pour many of the nutrients down the drain. For those who buy their vegetables from shop or market it is even more important to preserve nutrient qualities of vegetables during cooking, because bought green vegetables particularly have already lost some value during the period between gathering and preparation. In this article Eleanor Couston, Field Officer in Rural Sociology, Department of Agriculture, Timaru, gives simple instructions for conserving the maximum value of vegetables.

After taking great care in the cultivation of the garden and growing fresh vegetables many people then pour most of the nutrients in them down the kitchen sink.

THE home gardener has the satisfaction of producing food of high quality and is independent of the vagaries of the market. However, to derive the full benefit of home-produced food, the housewife must follow the rules or much of the labour expended will be in vain. The greatest value of vegetables lies in their mineral and vitamin content, but they also provide cellulose or roughage and variable amounts of protein and carbohydrate. As many of the nutrients are soluble in water or destructible by heat or on exposure to air, the best methods of preparation and cookery should be known and followed.

To provide a daily menu containing adequate quantities of the most important nutrients vegetables should be chosen to include the following:—

Generous serving of potato;

One or more servings of green vegetables, cauliflower, or swede;

One other vegetable.

The most important feature in the selection of vegetables is their freshness. This applies particularly to green vegetables, which, from the time of gathering, gradually lose their vitamin C. Dr. Faith Fenton, Professor of Food and Nutrition, Cornell University, has stated, "Vitamin C may be taken as the criterion of quality and nutritive value of vegetables. If it is retained, so also are other attributes. . . . **The challenge is to see that the maximum amount of vitamin C is retained in vegetables up to the time they are actually consumed.**"

Maturity, Price, and Cleanliness

Other points to look for are maturity, price, and cleanliness. Although it is uneconomical to gather vegetables before they have reached maturity, there is a tendency to err in the other direction and to allow them to remain ungathered until they have become woody and tough. The French are renowned for their "petit pois", young green peas which melt in the mouth; although use of peas at this stage is extravagant, they are preferable to the overmatured products sometimes served in this country. Price also is important, and best use of vegetables in season and at reasonable cost should be made. Bought vegetables should be reasonably free from soil and sand.

Storage

The experienced home gardener will know when to gather root vegetables for storage; that is, at the stage where they are still tender but mature enough to be full flavoured and ripe. Root vegetables for current use should be kept in well-ventilated racks in a cool, dry place, and those for winter use in layers of sand or dry soil. Onions, marrows, and pumpkins require circulation of air for good keeping.

Green vegetables should never be stored unless they are quick frozen. Maximum value is obtained from green vegetables when the least possible time elapses between gathering and consuming. If a short time lag is unavoidable, less loss will occur if the vegetables are kept in a covered dish in a refrigerator or, failing this, in a cool, dry place. For those fortunate enough to possess a home freezer the storing of surplus

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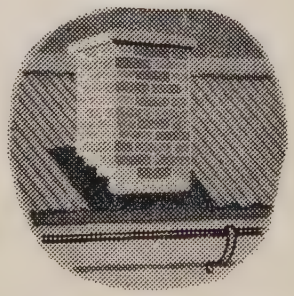

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Vegetable chowder provides a nutritious meal.

green vegetables is simple, and provided the process is carried out in the approved way, there will be little loss of nutrients or flavour. Vegetables which are not cooked before serving are not suitable for deep freezing.

Preparation

Although different methods of preparation are necessary for different vegetables, there are fundamental principles which should be observed. The best method of preserving the nutritive value of such vegetables as potatoes, kumaras, and beetroot is to cook them with the skin on. When it is necessary to peel vegetables care must be taken to pare them as thinly as possible. This can be accomplished in most cases much more satisfactorily with a special potato peeler than with an ordinary knife. With a little practice the housewife will soon acquire skill in using this utensil and save time in both vegetable and fruit preparation. A case of apples peeled in 20 minutes is an example of what can be done.

Vegetables require thorough washing, but they should not be soaked. A small brush kept for the purpose is invaluable for cleaning such vegetables as young carrots, potatoes, and celery. The soaking of vegetables, especially when they are cut in small portions, may lead to considerable losses in nutritive value. Less loss will occur if the vegetable is covered with a damp cloth or wrapped in aluminium foil and placed in the refrigerator. As vegetables contain a substance which on exposure to air will quickly cause destruction of vitamin C, they should be cut or sliced just before they are cooked. Cutting with a sharp knife will cause little loss, but grating, which exposes a large surface to the air, may lead to considerable loss. Less loss occurs when vegetables such as cabbage are shredded with a sharp knife before cooking than if chopped hot after cooking. Destruction of vitamin C continues quickly after the vegetable has been cooked and for this reason it must be served as soon as possible.

Although it is advisable to include some raw fruit or vegetable in each day's diet, there are many reasons for the inclusion of well-cooked vegetables also. This applies particularly in the case of young children and older persons whose digestive systems are not capable of dealing with large quantities of unsoftened cellulose. Cooking also converts starch into a more easily digestible substance and in many cases improves palatability.

Flavour

Flavour as well as nutritive value must be retained, and to do this short cooking periods are better, because long cooking will either destroy the flavour or make it too strong. The comparison between cabbage cooked for 10 minutes and that cooked for ½ hour is a good example. Apart from spoiling the flavour, long cooking will affect the colour, particularly of green vegetables. It is important to add the right amount of salt during cooking and other suitable flavourings for different vegetables. Pepper is added after cooking, and butter, parsley, chives, mace, or paprika may all be used to give colour and variety.

Colour

Vegetables are sometimes classified according to colour into green, yellow, white, and red, and some knowledge of the effects of heat, acid, and alkali on these pigments is useful as a guide to their cookery.

Green vegetables: The colouring matter is slightly soluble in water, but when they are cooked quickly in boiling salted water this colour is well preserved. Alkali, such as soda, will intensify this colour, though acid turns it olive green. However, the practice of adding soda to green vegetables to intensify colour is not advisable, as it destroys some of the vitamins and produces an unpleasant texture.

Yellow vegetables: The colouring matter is stable to heat, acid, and alkali, and therefore cooking has little effect on it.

White vegetables: The colouring matter is soluble in water, colourless in acid, and yellow in alkali, and heat will produce a greyish brown. To preserve their whiteness these vegetables should be cooked in a small amount of water without the addition of alkali for the shortest possible time. Iron also affects white vegetables, giving them a green or brown tinge, so that they should not be cooked in iron or chipped enamel saucepans.

Red colouring, present in red cabbage and beetroot, is readily soluble in water, hence the advisability of cooking beetroot with its skin on. Alkali will change this red to a purplish colour; acid will produce a more intense red. When vinegar is added to beetroot a rich colour develops.

As the objects in cooking vegetables are:—

1. To preserve maximum nutritive value;
2. To improve palatability and digestibility;
3. To preserve flavour and colour; and
4. To provide variety,

it is necessary to review cookery methods and to find the most efficient. Some methods are suited to all types

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of vegetables and others to specific varieties.

Pressure Cooking

As length of time of cooking is very important in conserving nutrients in vegetables, the pressure cooker ensures a minimum loss. Only a small amount of water is necessary and this helps to prevent loss through leaching. Care must be exercised to prevent overcooking, but if the manufacturer's directions are followed carefully, pressure cooking will result in considerable saving not only in fuel but in the nutritive value of the vegetable. This method is suitable for all types of vegetables.

Baking

Another good method for preventing loss of nutrient is by baking vegetables in their skins. Potatoes and kumaras may be cooked this way. After careful washing and scrubbing they are brushed with melted butter or salad oil and placed in a hot oven at 400 degrees F. The skin should be kept whole during cooking, as this retains the steam and produces a floury product. To test for "doneness" they are pressed between the fingers. When cooked they are pricked with a fork to form a cross on top so that some of the floury interior is forced through the skin. Butter is added and a garnish of paprika or chopped parsley.

Pan Cooking

Pan cooking is suitable for such vegetables as cabbage, spinach, shredded french beans, and mushrooms. After the vegetables are washed and prepared they are placed in a heavy-base shallow pan containing a small amount of melted butter. They are then sprinkled with salt, covered with a tightly fitting lid, and cooked over moderate heat. The pan is shaken occasionally to prevent the vegetables from sticking. The vegetables are cooked in their own steam; they cook quickly, and there is no "leaching", with the result that a high proportion of nutrients is retained. Flavour also is particularly good. Young root vegetables may also be cooked this way provided they are covered with wet lettuce leaves, which will provide sufficient moisture for conversion to steam.

A somewhat similar principle is involved in the use of a "waterless cooker", which will cook a whole meal over one burner. When vegetables are to be cooked by this method they should be moist from washing or have 2 or 3 tablespoons of water added to provide the necessary steam. Cooking by this means is not quicker than other steaming methods, but the cooker may be of use where limited top space is available. It is suitable only for root vegetables.

Boiling

Boiling is probably the most commonly used method of vegetable cookery and the one where faulty procedures lead to greatest nutritive losses. The majority of vegetables may be cooked by boiling, and if correct procedures are adopted, the losses can be reduced considerably. The prepared vegetables are added to a small quantity of boiling, salted water, the pan covered tightly with a lid, and the water brought back to boiling as quickly as possible. They are then cooked at a moderate rate until tender, and drained, seasoned, and served immediately. The vegetable water should be concentrated and used for soup, sauce, or gravy.

If it is necessary to replenish the water during cooking, it must be boiling. If butter is plentiful, a small piece added to the water will help to prevent sticking and improve the flavour.

Combination vegetable plate as a luncheon dish.

Roasting

Careful methods must be used in roasting; otherwise a fatty, indigestible product will result. Roasting increases the energy value of the vegetable by the absorption of fat, but there are greater losses of vitamin C than in boiling. However, roast vegetables, if crisp and golden brown, are a popular addition to a meal, and as they generally accompany a green vegetable, can be included for variety. Carrots, marrow, pumpkin, onions, parsnips, potatoes, and kumaras may all be roasted.

To avoid a fatty product and to reduce the cooking time the fat used must be hot. The vegetables should be wiped with a cloth to remove moisture and to prevent spattering. If desired, potatoes and kumaras may be rolled in seasoned flour. The prepared vegetables can be placed either round the roast or in a roasting pan containing hot fat to the depth of about ½in. They are then cooked in a moderate oven, with occasional basting and turning to ensure even browning. The fat is then poured off and, if necessary, the vegetable may be returned to the oven for further browning.

Frying

Frying has its uses in providing texture contrasts, but vegetables cooked in this way are generally cut in small portions and so tend to lose nutrients readily. However, as an accompaniment to a meal such foods as French-fried potatoes, Saratoga chips, or sprigs of cauliflower dipped in egg and crumbs and fried can be very appetising. Tomatoes, too, can be fried, and in these little loss occurs, as the vitamin C of tomatoes is comparatively stable to heat. When foods are fried in deep fat it is necessary to have the fat at the correct temperature. The bread tests which were given in the article "Deep-fat Frying" in the July 1949 issue of the "Journal of Agriculture" are a simple means of gauging temperature.

Braising

Further variations can be introduced by braising, and carrots and other root vegetables, celery, peas, onions, leeks, etc., may be cooked by this method either alone or in combination. The vegetables are prepared, sauted in a little fat or butter, placed in a casserole, and seasoned. A small amount of stock is added and the casserole covered with a lid and placed in a moderate oven to cook. Any remaining stock should be used as a sauce.

Whatever the method used, the following points should be observed:—

1. Use the vegetable as soon as possible after gathering it from the garden.
2. Cook it without paring when possible.
3. Cook it in a minimum amount of water. See that the water is boiling.
4. Cover the saucepan tightly. Cook for the shortest possible time.
5. Use the water for sauce, soup, or gravy.
6. Avoid the use of soda.
7. Use as soon as possible after cooking is completed; "keeping hot" is destructive of nutrient values and flavour.

An exception is sometimes made to point 4 in the case of strong-flavoured vegetables, such as cabbage, onions,

Vegetable	Method	Time (minutes)
Artichokes (Jerusalem)	Scrub well; steam or boil; remove skins after cooking or peel thinly before cooking; drain. Serve with butter, chopped parsley, or with white sauce. Or peel and roast in a little hot fat.	Boil 15-20 Roast 40-50
Asparagus	Wash well, scrape thick ends, and trim; tie in bundles with fine string; boil in deep saucepan with heads up; drain. Serve with melted butter or Hollandaise sauce.	Boil 20-30
Beans, broad	Young beans. Wash; leave whole or slice. Older beans: Wash, shell, and boil; drain. Serve with melted butter or white or parsley sauce.	Boil 10-15 Boil 30-40
Beans, french	Wash, cut off tops and tails, and string. Cut into ½in. or 1in. pieces or slice diagonally; boil; drain. Serve with melted butter. Or pan cook.	Boil 20-30 Pan cook 8-10 shredded
Beans, haricot (dried)	Pour boiling water over beans and soak for 4 to 6 hours; simmer till tender; drain. Serve with melted butter and chopped parsley.	Simmer 3 to 4 hours
Beetroot	Cut off tops, leaving about 1in. of stalk to prevent "bleeding". Wash without breaking the skin. Boil with skin on in water to cover. Drain, slice, and add to seasoned vinegar or cut in cubes and serve hot in a suitable sauce.	Boil 1½-2 hours
Brussels sprouts	Remove wilted leaves; cut off stalks; wash well; boil, drain, and serve with melted butter.	Boil 10-15
Cabbage	Remove coarse outer leaves, cut in quarters, and remove core if woody; shred with sharp knife; boil, drain, add pepper (if desired), and butter. Or pan cook.	Boil 10-15 Pan cook 8-10
Carrots	Scrub and leave whole if young; boil or steam. Wash and scrape old carrots; slice, dice, or cut lengthwise; boil, steam, or roast. Serve with butter and chopped parsley or with white sauce if boiled or steamed. They may also be mashed and served alone or with mashed parsnips.	Boil 15-20 Steam 20-30 Boil 20-30 Steam 30-40 Roast 50-60
Cauliflower	Remove coarse outer leaves and hard core; break into sprigs or leave whole; boil with heads up. Drain and serve with butter or well-seasoned sauce.	Boil 25-30 (whole) Boil 10-15 (sprigs)
Celery	Remove root, outer stalks, and most of green top. Separate the stalks and wash well with vegetable brush. Cut into 1½ to 2in. strips; boil; drain. Serve with white sauce or variation.	Boil 15-20
Kumaras	As for potatoes.	
Leeks	Remove the roots and coarse leaves, and, if necessary, part of the green top. If muddy, cut in halves lengthwise. Wash well; cut into 3in. lengths. Boil, drain, and serve with melted butter or white sauce.	Boil 15-20
Marrow	Wash; cut through centre lengthwise; remove seeds and pith with sharp-edged cooking spoon; cut in suitable portions. If young, cook with skin on; otherwise peel. Boil and drain well, or steam. Serve with melted butter and chopped parsley or white sauce or variation, or remove skin and roast.	Boil 10-15 Steam 20-25 Roast 35-45
Mushrooms	Rinse in cold, salted water and drain on a cloth; trim the stalks, and peel; pan cook, saute, or cook in milk and thicken before serving.	Pan cook 10-15 Saute 10-15
Onions	Peel and remove tough outer layers; if large, cut in halves; boil; drain well. Serve with butter, white sauce, or variation. Or roast or saute.	Boil 20-35 Roast 45-60
Parsnips	Scrub, peel (if old), or scrape. Remove the hard centre if necessary. Cut in suitable sizes; boil or steam; drain, and serve with butter, salt and pepper; or mash. Or roast.	Boil 20-30 Steam 30-40 Roast 50-60
Peas	Shell and rinse in cold water; boil; add a sprig of mint and, if desired, a small quantity of sugar; drain; serve with butter.	Boil 10-20
Potatoes (new)	Scrub or scrape; boil; drain; serve with parsley and butter.	Boil 15-20
Potatoes (old)	Wash and scrub if cooking with skins on; or wash and peel; boil and drain, or steam. Serve with melted butter and chopped parsley, or seasoned and mashed. Or roast, bake, or deep-fat fry at 395 degrees.	Boil 25-40 Steam 30-45 Roast 60-75 Bake 45-60
Pumpkin	Treat as for marrow.	Boil 20-30 Steam 35-40 Roast 50-60
Silver beet	Remove the roots; wash and separate the green and white portions. These may be cooked separately or together. Cut the white portions into 1½ to 2in. lengths and shred the green portions. If the portions are to be cooked together, start cooking the white portion while shredding the green. Serve the green or mixed green and white with butter, or the white separately with white sauce or variation.	Boil stems 10-15 Boil green 5-10
Spinach	Remove the roots and stalks; wash thoroughly in several waters. Pan cook, or cook without the addition of water. Drain and serve plain, or chop slightly and add butter. A pinch of nutmeg will improve the flavour.	Boil 8-10 Pan cook 8-10
Swedes	Wash and peel; cut into medium pieces; boil or steam. Drain and serve mashed with pepper and butter.	Boil 20-30 Steam 30-40
Sweet corn	Remove the husks and silk; wash; boil in water to cover. Serve with butter.	Boil 10-15
Turnips (white)	Wash and peel. If small, leave whole; otherwise cut into portions. Boil and drain, or steam. Serve with butter and parsley or white sauce.	Boil 15-20 Steam 25-30

turnips, and cauliflower, which contain sulphur compounds. These compounds are volatile and will pass off in steam. After the cooking water has returned to boiling point the lid may be removed for a few minutes to release these vapours and then replaced and cooking carried out as before. With fresh vegetables, however, this should not be necessary.

Infinite variety can be added to the menu by clever use of all types of vegetables. Recipe books abound with suggestions and there is no reason to cling to stereotyped service. Recipes may also be found in back numbers of the "Journal of Agriculture": "Variety in Salads" (February 1947), "Savoury Vegetable Dishes" (April 1949), and "Hot Tea Dishes are Important for Cold Days" (October 1950). The home gardener can introduce a great selection of both vegetables and herbs from which salads and vegetable dishes can be made artistic and satisfying. Most gardens have a supply of parsley, mint, and chives and, perhaps, of sage and thyme, but few possess watercress, endive, mustard and cress, tarragon, horse-radish, or rosemary.

To try to improve a faulty dietary habit New Zealanders should eat more vegetables both raw and cooked and serve them as a main dish frequently. A cheese sauce, a milky basis to a soup, or the addition of pea meal, dried peas, beans, or lentils will supplement the protein in a vegetable dish and provide a nutritious meal.

Combination Vegetable Plate

For a luncheon or tea dish, combination vegetable plate will provide a welcome change from meat or fish. It is a good method of using left-over vegetables. All kinds of vegetables can be used, but a contrast in colour and texture is desirable. The following are suggestions for each season of the year:—

Spring

Creamed potatoes (cubed cooked potatoes, reheated in thin white sauce)
Spinach with egg garnish
Buttered carrots

Summer

New potatoes, parsley butter
Green peas and beans
Grilled tomato with cheese

Autumn

French-fried potatoes
Cauliflower with cheese sauce
Mixed diced vegetables

Winter

Baked stuffed potato (with chopped parsley or chives, minced ham, or grated cheese added)
Brussels sprouts
Celery and white sauce
Serve with grilled bacon if desired

Vegetable Chowder (Serves 4)

1 onion sliced
1 cup of diced carrot
1 cup of diced potato
1 cup of diced swede
1 cup of vegetable stock or water
1 cup of milk
¼ cup of diced bacon
1 tablespoon of chopped parsley
1 teaspoon of salt
Few grains of pepper
4 cracker biscuits

Cook the bacon in an aluminium saucepan over low heat. Add the onion and cook till golden yellow. Add remaining vegetables, salt, pepper, and stock and cook till tender. Add the milk and reheat. Taste and season if necessary. Add chopped parsley and pour over crumbled crackers and serve.

Carnations are Colourful for Garden Display

CARNATIONS, known technically as *Dianthus*, are among the most popular and widely grown of present-day garden flowers. They have been grown, selected, bred, and generally improved for many centuries and are now subdivided to many groups and sub-groups, some of which are grown commercially for cut flowers and others which are used for colourful garden displays. Their culture is briefly discussed by C. K. Ellis, formerly Horticulturist, Department of Agriculture, Dunedin, in this month's article for the flower gardener.

THERE are two chief groups of carnations, these being the "borders" and the "perpetuals". These two groups are subdivided: the borders to the grenadins, fancies, bizarres, picotees, etc., and the perpetuals to the American carnations, marguerites, and chabauds.

The chief difference between the borders and the perpetuals is that the borders flower during a distinct period of 2 to 3 months of summer and the perpetuals, provided climatic conditions are suitable, will flower continuously throughout the year.

[*Douglas Elliott photo.*

[*Douglas Elliott photo.*

Yellow Supreme carnations are shown in this illustration and that at the top of the page.

Site and Soil

Carnations are lovers of sunlight and they will tolerate a wide range of soil types and fertilisers. Drainage is important and must be good, especially in areas of heavy rainfalls and heavy soils. The plants will not tolerate waterlogging and, if necessary, any tendency toward this condition should be overcome by tile draining or by growing the plants in raised beds.

A soil condition about neutral has been found to be best and in many cases liberal dressings of lime will be necessary to bring the soil to the best condition for carnation culture.

Fertilisers and Manures

Carnations cannot be described as gross feeders, but their requirements are fairly exacting. Like most garden plants they demand readily available nitrogen, phosphate, and potash. They will not tolerate fresh animal manures, but dressings of well-decayed animal manure at the rate of a bushel to each 5 sq. yds., applied 2 to 3 months before planting, are beneficial.

Fertilisers are necessary and are best applied in the form of sulphate of potash at ½oz. per square yard and bonedust at 1oz. per square yard immediately before planting. Light applications of nitrate of soda applied in water during the growing season are advantageous in maintaining healthy foliage.

Planting out

The best time for planting out to open beds depends largely on climate

The preparation of a pot for raising seed.

and partly on the type of carnation. In milder districts planting out is normally done during autumn and the plants are well established and well grown before they begin to flower in the following summer. In colder districts spring planting is no doubt more successful. If the beds are devoted entirely to the culture of carnations, the plants are placed about 15in. apart from each other in each direction. When firmed into the soil the plants should not be buried to a depth greater than the old soil mark on the stems.

Subsequent Treatment

Light cultivation with a push hoe throughout the summer will keep the surface soil loose and maintain a good soil structure and at the same time prevent the establishment of weeds. In hotter districts mulches of well-decayed animal manure, compost, leaf mould, or even grass clippings spread over the surface of the soil will be beneficial in that they assist in retaining the moisture and keeping the soil cool.

Perpetuals will need "stopping" to produce bushy plants and thus increase the number of flowering stems. Stopping is not necessary with border carnations. Only actively growing shoots should be stopped and when growth is slow during winter the operation should not be carried out until spring. Stopping consists of nipping out the growing point about seven or eight joints above ground level to encourage side growths. If only two or three vigorous branches result from the first stopping, they also may be stopped to encourage further branching. It is not a good practice to pinch out the growing tips at the time of planting out, as it serves then only to give the plants an additional check from which to recover.

Both perpetuals and borders are fairly severely disbudded when the plants are being grown to produce show flowers. Any laterals produced from the flower stems should be removed almost immediately they appear to allow the crown bud to develop to its maximum size. Flower buds appearing close to the crown should be allowed to swell a little to facilitate easier handling before being removed, otherwise damage to the crown bud may result.

Immediately growth becomes vigorous in spring it will be necessary to stake and tie the plants. They should be done individually with a stake placed on either side of the plants. For preference, wire rings should link the stakes and encircle the plants. In beds of large numbers of plants it is sometimes possible to drive stout stakes in at either end of the bed and stretch a wire between the stakes standing opposite each other. Cross-ties can be made between the wires to support the individual plants.

The individual plants, if well grown, should be satisfactory for normal garden cultivation for 2 or even 3 years, when they should be removed and replaced with young plants.

Propagation

Carnations can be propagated by seed, by layers, and by cuttings. Multiplication of a named variety by seed is not often possible because the greatest proportion of the resultant seedlings will have reverted to one or other of the original parents of the variety or to one of many intermediate types. Propagation by layering is probably the simplest method by which the gardener can increase his stocks, but propagation by cuttings is the most economical method and will give rise to the greatest number of new plants.

There are a few border carnations which will come true when raised by seed. A soil mixture consisting of two parts of medium loam and one part of sharp sand, and one part of well-decayed leaf mould, is a satisfactory medium in which to germinate seeds. Seed may be sown in seedling boxes or old pots or pans in which excellent drainage is provided and these should be filled to within ½in. of their brims with the mixture and firmed down moderately. The seed is scattered in a thin layer over the surface of the soil and a very thin covering of soil placed on top of the seeds. The soil should be thoroughly saturated with water by placing the containers in a bucket or trough and raising the water level to just below their top edges; they should then be placed in a sheltered position where the temperature will not fluctuate very greatly from between 55 and 65 degrees F. A sheet of glass and one of brown paper should be placed over the surface to retain moisture and exclude brilliant light. The seeds should germinate in a fortnight or 3 weeks and immediately a good proportion of the seedlings appear the brown paper should be removed to prevent them from becoming drawn. After a few more days the glass should also be removed.

Layering is done by removing the lower leaves of a strong shoot and cutting a slanting notch about ½in. long and half-way into what will form the underside of the shoot.

Great care must be taken at this stage not to over-water, as the seedlings are very susceptible to the attacks of "damping-off" fungi and in any case will not tolerate wet feet. Immediately they are big enough the seedlings may be pricked out into boxes in a similar soil mixture with a space of 1½in. or 2in. each way between them. When they reach 2in. or 3in. in height they should be potted up into 4in. pots or be reboxed with more liberal spacing and when 5in. high they should be ready for planting to the open border.

Layering is the method most readily applicable to the border carnations which respond best of all to this treatment. Borders are not as satisfactorily propagated from cuttings as are other types. Layering may be carried out at any time of the year, but plants are produced more quickly and more readily if it is done during November, December, or January. A good plant should be selected as a parent and a few of the strongest shoots prepared for layering by stripping off the lower leaves and cutting a notch on the lower side about ½in. long and half-way into the stem. The notch should be held open by a small piece of a wooden match or a small stone and the shoot pegged down at the point at which the notch is cut and held into the ground by small wire hooks a few inches long. A little good soil should be scattered about the point where rooting should take place and be kept moist for 4 or 6 weeks, after which time the roots should be well developed and the new plant can be cut away from the old. After a few days these plants may be transplanted to the open border.

Almost without exception perpetual carnations are best propagated from cuttings. The best plants should be selected as parents and the best shoots taken for cuttings. Neither the lower shoots nor the uppermost shoots are really satisfactory, as they are either under-developed or have short nodes and are rather hard. Intermediate shoots are the most satisfactory. These shoots should be removed from the stem by pulling them sharply downward. The heel which comes away from the old stem is trimmed with a sharp knife and the lower leaves cut off. The cutting is now ready for insertion into the rooting medium, preferably of pure, sharp sand. This medium must be firmed down about the cutting and kept moist during the period required for the cuttings to take root, normally between 3 and 6 weeks. The cuttings should be shaded from brilliant light and, if possible, the temperature maintained at somewhere about 60 degrees F. Once strong roots have grown the new plants should be potted up into 3 or 4in. pots and when firmly established with a good ball of roots they may be planted out in the open border.

Pests and Diseases

Thrips are minute insects (up to 1/16in. long) with narrow bodies and two pairs of wings. They suck the sap of both the foliage and the flowers, and the silvery brown scurf which they leave on both spoils the appearance of the plants. They may be controlled by a D.D.T. spray (1lb. of 50 per cent. wettable powder to 100 gallons of water) or by the use of a 5 per cent. dust.

Red spiders are minute red or yellow insects which are more severe in their attacks on glasshouse carnations than on outdoor ones, but in a dry season they will do considerable damage to plants in the borders. The use of H.E.T.P. (Hexone) at one part to 1600 of water is very beneficial, but Hexone is extremely toxic to human beings and should be used only with great care.

Carnation rust: Infestations of carnation rust are seldom severe. It first appears as brownish dusty spots on the stems and foliage and control may be attained by preventive means by keeping the foliage as dry as possible and by keeping the borders free from weeds and not too closely planted.

Virus: A virus disease of carnations gives a yellowish mottling of the shoots and becomes most pronounced on the young soft growths. Control consists chiefly of keeping down greenflies and thrips, which often act as vectors for virus diseases, and by removing and burning severely infected plants.

[Photo News Ltd. photo.

The sweet alyssum (Lilac Queen) flowers over a long period and is among the annuals which may be sown in the open in September and thinned to 8in. apart in October.

Garden Work for October

Annuals sown in the open during September should have germinated by the middle of October. As soon as the seedlings can be handled easily they should be thinned to about 2in. apart, and the seedlings removed may be used to fill in any gaps. Further thinning should take place later when the plants have established themselves more firmly. Dwarf varieties such as alyssum should be thinned to a minimum of 8in. apart and vigorous types such as godetias should not be less than 18in. apart. Adequate spacing for such types as cornflowers, candytuft, and pot marigolds is 10in. to 12in.

Plants starve each other if they are allowed to grow too closely, premature flowering is induced, and the plants seed and die at an early stage.

Bedding plants may be planted out in many districts in October, but in districts which experience late frosts it is advisable to delay the planting out of such tender varieties as salvias, petunias, and zinnias until the risk of frosts is mainly past. Boxes of plants should be hardened off thoroughly before planting out by leaving them for a period in a cold frame or standing them in the open, protected by a scrim cover. Such hardened plants are less likely to be damaged by light frosts than those planted straight out from a glasshouse. Boxes of bedding plants should be thoroughly watered a few hours before planting out to ensure that they are not short of moisture and to make the job of lifting the plants from the soil easier and less likely to cause damage to the roots.

Biennials such as sweet william, myosotis, and Canterbury bells can be sown in boxes out of doors during October.

Begonia cuttings, rooted in the greenhouse, can be potted up into 3in. pots as soon as it is considered that the roots are sufficiently developed. The potting mixture recommended consists of seven parts by weight of loam, three of leaf mould and two of sharp sand, to which is added 2oz. of dried blood, 2oz. of superphosphate, 1oz. of sulphate of potash, and 1oz. of carbonate of lime to each cubic yard.

Chrysanthemum cuttings made and inserted in the rooting medium during September should be rooted by about 3 weeks from the date of planting. They should be hardened off preparatory to planting out. At the time of planting the top should be nipped out of any plants which have not begun to produce side shoots. Where severe frosts are experienced it is wise to delay the planting out of newly rooted cuttings until November. Old chrysanthemum plants left in the border from last year should have the number of shoots reduced as soon as they are about 2in. high. There is still time to lift and divide old clumps, provided that the shoots are not more than a few inches long. In borders chrysanthemums should be planted in groups of three or four plants of the same variety to get an appreciable amount of one colour at flowering.

Dahlia tubers boxed up in a warm place during August and September will be making good growth of new shoots. Some of these shoots may be removed to be used as cuttings and the clumps of tubers can still be pulled apart to be replanted as separate plants. Care should be taken to see that there is at least one strong shoot on each piece that is divided off.

Fuchsias should be pruned during October if the job has not already been done. Old, dead, weak, or straggly shoots should be cut out altogether. The healthy shoots should be shortened back, the strongest ones to about 6in. and the weaker ones to about 1in. from their bases.

Evergreen shrubs are best transplanted in early spring. A few shoots or branches should be removed to relieve the burden on the roots, and the hole should be dug large enough to take the roots fully outspread. When transplanting is finished the new soil level should be at the position on the stem marked by the old soil level.

Geraniums, though tolerating a certain amount of frost on their leaves, will be killed readily by severe frosting of the roots. In cold districts where the plants are lifted in autumn and stored in a frost-free place they should be planted out again in October. The plants should be cut back rather severely to encourage vigorous new growth and shapely bushes.

Gladiolus planting can be continued during October in any district.

Herbaceous plants such as delphiniums, lupins, pyrethrums, and hollyhocks can be raised readily from seed sown in open beds or in boxes or pots outside during October. All named varieties must be propagated vegetatively, and cuttings of young shoots taken from the growing plants in spring will root easily in a cold frame.

Lawn edges should be trimmed each spring, by cutting them at an angle of about 45 degrees away from the grass. This ensures a firm edge that will not break away when trodden on or when the lawn mower wheel accidentally runs over it. This trimming should not be done until possibility of frosts has passed, because frosts loosen or "heave" the soil.

Rhododendrons often set seed after the flowers have faded. The seed pods should be picked off as they develop. Old, straggly bushes can be cut back hard as soon as the flowers fade. This means that no blooms will be obtained the next year, but the mass of young growth that results will soon build a shapely new bush.

Water lilies grown in baskets or tubs may be removed from the water this month and have most of the mud washed away from them. Replace it with equal parts of good garden soil, well-rotted animal manure, and sharp sand. The roots should never be allowed to dry out during this operation. While the water lilies are out it is a good plan to clean out the pool.

Seasonal Troubles

Greenflies will be appearing in numbers during October on a variety of plants, including roses. At first appearance this pest should be sprayed, preferably on a warm day, with nicotine sulphate at the rate of 1 part in 800 parts of water, or ½ fluid ounce to 2 gallons of water. To each 2 gallons of this mixture should be added 1oz. of soft soap or 3 fluid ounces of summer (white) spraying oil. This spraying should be repeated at 10-day intervals until all traces of the greenflies have disappeared.

Looper caterpillars, the larvae of the silver Y moth, are very troublesome on a wide range of garden plants during spring. They are often common on dahlias, geraniums, and salvias. The caterpillars grow to about 1¼in. long, are light green with white and darker green stripes on their backs, and are almost hairless. They eat from the lower surface of the leaves, leaving only a thin skin of upper epidermis which ultimately dies and falls out, leaving holes. When moving about, the caterpillars arch their bodies and proceed in a series of loops.

They can be controlled by spraying with a mixture of 2lb. of arsenate of lead powder to 100 gallons of water. Dusting with D.D.T. or derris is also effective.

Slugs and snails become numerous and do a great deal of damage during spring, especially to young plants and seedlings. Hedgehogs, natural enemies of slugs and snails, destroy appreciable numbers, but the best method of control probably is poison baits. Metaldehyde, sold as oblong white tablets, is extremely poisonous to slugs and snails. One tablet should be crushed and mixed with 2 handfuls of wheat bran or dried blood, and sprinkled lightly over areas frequented by the pests. If rain falls within 24 hours of making the application, it may be necessary to repeat the treatment.

Tulip "stripe" or "breaking" is a virus disease transmitted from plant to plant by greenfly. The flowers develop abnormal streaks of colour and the bulbs, though they usually continue to grow and multiply, will never be free of the disease. The home gardener should watch carefully for "streaked" buds, and if any appear, the plants, including the bulbs, should be dug and burnt immediately. A careful watch should be kept for greenflies feeding on the foliage or flowers and a spraying with nicotine sulphate should be given at their first appearance.

Comfortable Warm Jacket for a Young Man

THE comfortable jacket illustrated will give warmth and ease of movement to any young man, whether he spends his leisure hours in or out of doors. The 10-row pattern consists of diamond shapes in purl broken by narrow lines of stocking stitch and the garment can be made by following the instructions in this article.

MATERIALS required are: 10oz. of 3-ply fingering; 1 pair each of No. 11 and No. 12 knitting needles; 8 buttons.

Measurements: Length from shoulder, 22in.; width all round under the arms, 38in.; sleeve seam, 19in.

Tension: 17 stitches to 2in. in width and 11 rows to 1in. in depth.

Abbreviations: K., knit; p., purl; st., stitch(es); rep., repeat; inc., increase; dec., decrease; patt., pattern; beg., beginning.

The Back

With No. 12 needles cast on 151 st. and work 22 rows in k. 1, p. 1 rib. Change to No. 11 needles and work in patt. as follows: First row (wrong side): P. Second row * K. 1, p. 2, k. 5, p. 2; rep. from * to last st., k. 1. Third row: * P. 1, k. 3, p. 3, k. 3; rep. from * to last st., p. 1. Fourth row: K. 2, * p. 3, k. 1, p. 3, k. 3; rep. from * to end, finishing k. 2, instead of k. 3. Fifth row: P. 3, * k. 5, p. 5; rep. from * to end, finishing p. 3, instead of p. 5. Sixth row: K. 4, * p. 3, k. 7; rep. from * to end, finishing k. 4, instead of k. 7. Seventh row: As fifth row. Eighth row: As fourth row. Ninth row: As third row. Tenth row: As second row.

These 10 rows form one patt. Continue in patt. until the work measures 15½in. from beg.

Armhole shaping: Cast off 4 st. at beg. of next 6 rows, then cast off 2 st. at beg. of next 6 rows, after which dec. 1 st. at both ends of next 2 rows. Continue without further shaping until the work measures 21½in. from beg.

Shoulder shaping: Cast off 9 st. at beg. of next 4 rows, then cast off 8 st. at beg. of next 4 rows. Cast off remainder for back neck.

The Left Front

With No. 12 needles cast on 93 st. and work 10 rows in k. 1, p. 1 rib, then make a buttonhole as follows: Eleventh row: Rib to last 7 st., cast off 2, rib 5. Twelfth row: Rib 5, cast on 2, rib to end. Work a further 11 rows in rib, then change to No. 11 needles and work in patt. as for back, but keeping the 12 border st. in rib, and making buttonholes on every seventeenth and eighteenth row from previous one until there are 8 in all. Work 8 rows after the last buttonhole has been completed, then shape front edge by dec. 1 st. inside the ribbed border on the next row and every following fourth row until the work measures 15½in. from beg., ending at the armhole edge.

Armhole shaping: Still dec. at front edge as before, cast off 4 st. at beg. of next row and next 3 alternate rows, then cast off 2 st. at beg. of next 2 alternate rows, after which dec. 1 st. at same edge on the next row. Keeping the armhole edge straight, continue to dec. at front edge as before until 48 st. remain, then continue without further shaping until the work measures 22½in. from beg., ending at the armhole edge.

Shoulder shaping: Cast off 9 st. at beg. of next row and next 3 alternate rows. Continue in rib on the remaining 12 st. for a further 2½in. Cast off ribwise.

The Right Front

Work as given for the left front, but with ribbed border and all shapings at opposite edges and omitting buttonholes.

The Sleeves

With No. 12 needles cast on 71 st. and work 3½in. in k. 1, p. 1 rib. Change to No. 11 needles and work in patt., but inc. 1 st. at both ends of eleventh row and every following sixth row until there are 111 st. Continue without further shaping until the work measures 19in. from beg., then shape top by dec. 1 st. at both ends of every row until 17 st. remain. Cast off.

Making up

Press the work on the wrong side with a warm iron and damp cloth. Join the shoulders, then join the ribbed band and sew this across the back neck. Sew in the sleeves, then sew up the side and sleeve seams.

Press all seams. Sew on buttons to correspond with the buttonholes.

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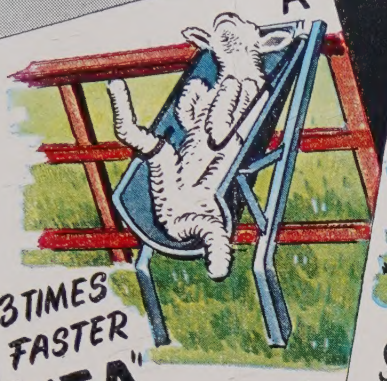

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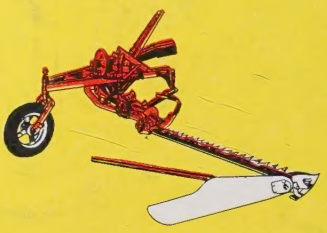

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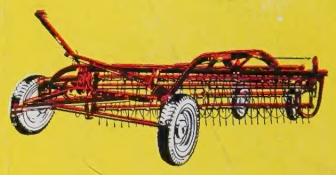

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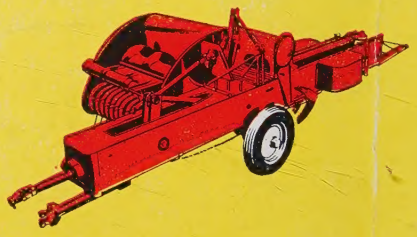

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